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SIAM BEFORE THE WAR

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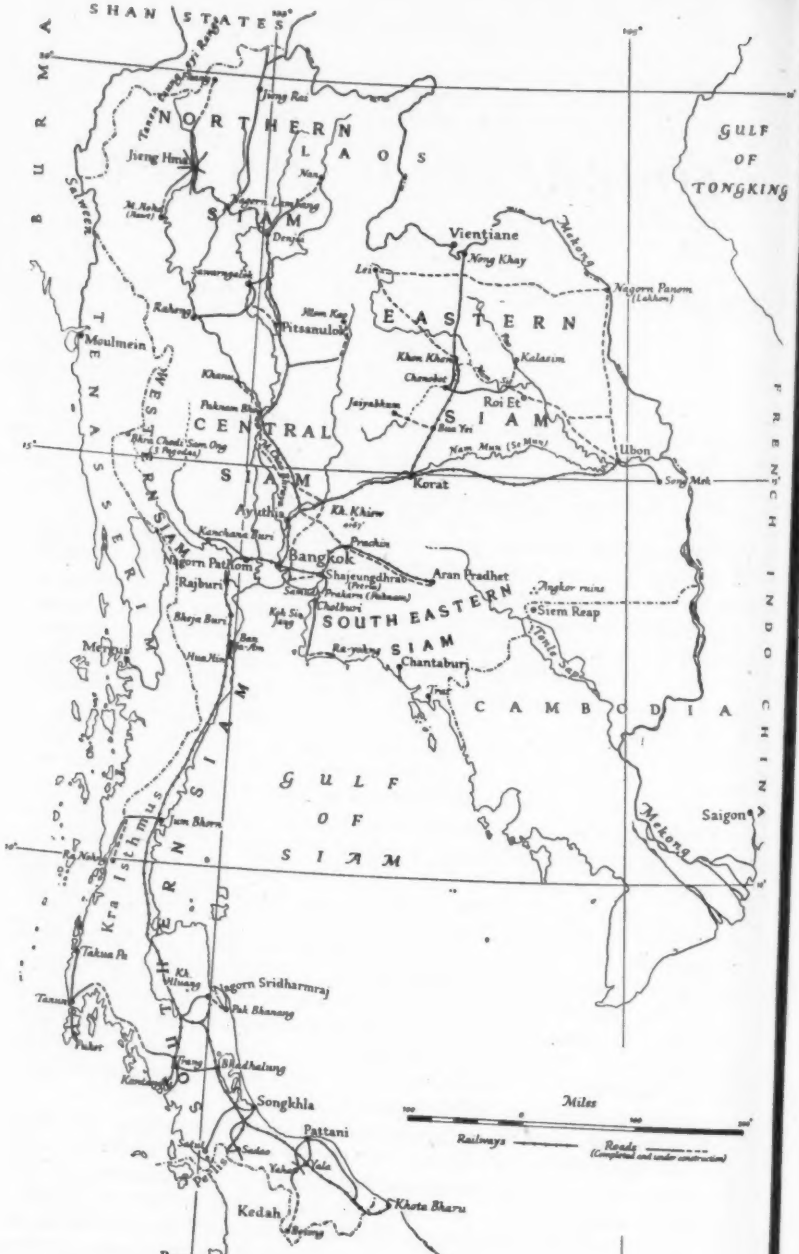
THE people of Siam call themselves "Thai" or "free" and their country Muang Thai (or Muang T'ai)—the Land of Free People—or alternatively Prades Thai. The European language in most use in the country is English and it was on 24 June 1939 that a notification of the President of the Council of Ministers changed the name Siam officially to Thailand. Despite the fact that we use conventional English names for all the countries of Europe, this difficult hybrid word, half Siamese half English, was recognized by the British Government, though whether the correct adjectival form is Thai, Thailandic, or Siamese does not appear to have been settled. With Siam now an enemy state it is understood that the conventional name Siam is again to be used officially and will therefore be used throughout this paper.

Within recent years this ancient kingdom has progressed by rapid strides towards the full stature of modern statehood and, largely by this internal progress, escaped domination by European powers in contrast with its neighbours. In 1932 the old absolute monarchy was replaced by a constitutional monarchy with an Assembly of Peoples' Representatives; in 1936 all existing treaties with foreign powers were denounced and some replaced by new treaties under which Siam regained complete juridical and fiscal autonomy.

Until the dispute with French Indo-China in 1940–41 the boundaries had undergone no changes since the treaty of 1909 with Great Britain under which the Malay States of Kelantan, Kedah, Trengganu, and Perlis passed to British suzerainty. The area from 1909 to 1939 was estimated at 200,148 square miles—about four-fifths of the area of Burma.

A partial census was taken in 1905, the first full census in 1909, and since then at roughly decennial intervals. In 1929 the population was 11,506,207; by 23 May 1937 this total had increased to 14,464,489. This is equivalent to a density of only seventy-two persons per square mile, but actually the population is very irregularly distributed. The bulk of the people is to be found in the capital, Bangkok (886,153 in 1937), and in the fertile rice-growing plains of central Siam; the remainder of the country is, for the most part, sparsely


SHAN STATES
BURMA
NORTHERN
LAOS
SIAM
GULF OF TONGKING
Vientiane
Nong Khay
Nakorn Panom
(Lakhon)
Mekong
EASTERN
SIAM
Pitsanulok
Moulmein
Tenasserim
CENTRAL
SIAM
Korat
Ubon
Roi Et
Kalasin
Khon Khaen
Chaiyabhum
Nam Mun (Se Mun)
FRENCH INDO CHINA
Ayuthia
Ka Khiew
Bangkok
Prachin
Nakorn Pathom
Rajburi
Shaeungdhrab
Aran Pradhet
Angkor ruins
Siem Reap
SOUTH EASTERN
SIAM
Chantaburi
Ranong
Tonle Sap
CAMBODIA
Meregui
Kra Isthmus
GULF
OF
SIAM
Saigon
Mekong
Takua Pa
Nakorn Sridharmraj
Pak Phanang
Songkhla
Pattani
Khota Bharu
Kedah
Penang
MALAYA
Miles
Railways
Roads
(Completed and under construction)

inhabited. Even on the rich alluvial plains only one-third of the land is effectively used, so that there are enormous possibilities of future development, possibilities which bid fair to materialize if the pre-war progress is any criterion.

On the north-west and west Siam adjoins Burma and the 900 miles of boundary, passing for the most part through highly mountainous country, were delimited by the Anglo-Siamese Commission of 1892–93. On the east, from the Gulf of Siam to the Burmese boundary, Siam is bordered by French Indo-China and the boundary was defined by treaty and delimited by successive commissions. For about half the distance the great river Mekong forms a clearly defined boundary, but in the south certain provinces once part of the old Kingdom of Cambodia but long since annexed by Siam passed in 1907, after protest from Siam, into the French sphere of influence and form the disputed territory restored to Siam in 1941. A similar tract of disputed territory is found in the mountainous Laos country in the north-east, where Siam claimed the Mekong as the natural boundary. In the south Peninsular Siam occupies the full width of the isthmus between southern Burma (Tenasserim) and Malaya, giving Siam a direct outlet to the Indian Ocean and interposing a belt of Siamese territory between the British spheres in Burma and Malaya. The boundary with the Malay States, delimited by treaty in 1909, was demarcated in 1912 by a Joint Commission. Though Siam's neighbours are thus Burma, French Indo-China, and Malaya the populous and developed centres of those countries are away from the border regions and Siam's boundaries usually run through sparsely inhabited tracts.

The heart of Siam is the basin of the Menam Chao Bhraya, often wrongly called in English books the River Menam: menam simply means river. Four main streams of almost equal size rise along the mountains on the Siam–Burma border and in the wild tangle of forested hills in the Laos country farther east and flow, in general, southwards, in deep parallel valleys before descending to the plains of central Siam, finally meeting at Paknam Bho (Paknampoh) to form the one main stream on which stands Bangkok the capital. The large saucer-shaped basin of eastern Siam is drained to the Mekong by the Nam Mun and its tributaries, whilst in the far north-east are mountain torrents draining directly to the Mekong. Some of the forested mountains of the west, west of Jieng Hmai (Chiengmai), lie in the basin of the Salween and thus within the physical hinterland of the Burmese port of Moulmein. Distinct from the rest of the country is southern or Peninsular Siam, stretching for 500 miles southwards from Bangkok to the borders of British Malaya.

Although earlier writers speak of the country as a whole, Siam thus falls very naturally into four or five divisions in many respects differing widely from one another. These divisions are now recognized and used in many official publications. They are: Northern Siam, Central Siam, Southern Siam, and North-eastern Siam. To these is frequently added South-eastern Siam and, less frequently, West Siam. The physical separation of these five or six divisions is enhanced by differences in population. The two great branches of the Lao-Tai family are the Lao, the dominant people of north and east Siam, and the Tai (Thai) or Siamese proper of centre, west, and

south. To the casual observer there is little difference between the two; the Lao may be called the "up-country" or jungle Siamese.

Northern Siam.—This division occupies about 60,000 square miles, between a third and a quarter of the country. It consists of a series of roughly parallel hill ranges, often of granite, and valleys excavated in old sediments trending north and south. The hills rise gradually from the south and south-east to the north and west where they merge into the impressive heights of the Tanen taung gyi range. They are all thickly forested except for occasional outcrops of bare rock or the clearings made by hill tribes. Many of the mountain streams dry up entirely in the hot weather; in the rains they rush down in foaming torrents and cascades to the Salween, the Chao Bhraya, and the Mekong. To quote Graham,[1] "The valleys vary between broad open lands smiling with crops, through which clear streams meander, and deep, shadowed gorges echoing to the voices of turbulent waters. Towards the south the rivers are fringed with wide banks of rich alluvial soil, near which the population clusters thickly, and where some of the most valuable agricultural produce of the Kingdom is grown." Jieng Hmai, railhead of the northern line from Bangkok, is the metropolis of Northern Siam. The population of the valleys is chiefly Lao and agricultural; the population of the hills includes a great variety of relatively little-known "hill tribes." Of the four main valleys, two at least are accessible by road. Northern Siam is the home of the teak forests and here elephants are still the chief working animals and beasts of burden. The teak logs are floated down the rivers, rafted, and taken mainly to the sawmills of Bangkok.

Central Siam.—This division, estimated to occupy 55,000 square miles, consists practically of one vast plain stretching from the foothills of the mountains which divide Burma from Siam on the west to the foot of the high ridges which mark the edge of the plateau of Eastern Siam on the east. Southward two extensions of the plain extend east and west of the head of the Gulf of Siam and the plain fades almost imperceptibly into the shallow muddy waters of the Gulf itself. Except for a few isolated hills in the south, the whole is dead level and flooded in the wet season (June to October or November). As a result of the flooding all houses have to be built on piles; even the cattle are housed in pile dwellings. The whole area is cut up by winding and ever-changing rivers and communication must be by boat. There are no roads and while in the dry season bullock carts lumber across the dry rice fields, in the wet season it is impossible to go even from one house to another without a boat. This is the rice-producing region of Siam and, apart from important fisheries along the coast, rice cultivation is almost the sole occupation of the people. Although it is the most densely peopled part of the country the land is by no means fully used. Only about a quarter to a third of the heavy clayey alluvial soils is cultivated; the remainder is covered with grass and weeds and awaits comprehensive drainage and irrigation schemes and the coming of a population to make it the greatest rice-producing district in the world.

[1] Graham, 'Siam,' 3rd ed., 1924.

Central Siam: rice fields and village in the dry season

Boat building at Hua Hin

Bangkok, showing spaciousness of city plan

Southern Siam: limestone hills, evergreen forest, and riceland

Bangkok, showing spaciousness of city plan

Southern Siam: limestone hills, evergreen forest, and riceland

Scenically the plain is uninteresting, but the wide expanses of skyline are broken by scattered palmyra palms with here and there clumps of bamboo which hide the small villages. Some watercourses are lined by tall trees and on the fringes of the plain, especially in the north, are considerable patches of woodland scrub or jungle. On the margins the plain usually ends abruptly.

The sluggish rivers choke their own beds with silt and so often flow on ridges of their own making slightly above the general level of the plain, a fact that renders uniform flooding exceptionally easy. Not only is the general level of the plain thus being raised steadily but it is estimated that the northern shores of the Gulf are advancing seaward at the average rate of several feet a year. From Paknam Bho to the sea is about 150 miles, but the main river follows a tortuous course giving off many branches which may or may not rejoin the main river. In its lower reaches, as with the Irrawaddy, the banks are lined with bamboos and trees shading an almost continuous succession of huts, monasteries, and pagodas which sometimes group themselves into a straggling village. The river is at once a water supply, a sewer, and a highway.

Eastern or North-eastern Siam.—This region, of about the same area as the last, offers a complete contrast. It is a huge shallow basin of almost horizontal red sandstone, known as the Korat Plateau, within a circle of hills, and tilted gently towards the east so that it is drained by streams which rise near the plateau edge and unite with the Nam Mun before emptying into the Mekong. The western edge of the plateau overlooks the plains of Central Siam and rises to heights of over 1000 feet. This plateau edge has been sufficient to isolate the region in an extraordinary way from the rest of Siam. Until the coming of the railway to Korat it was little known to outsiders, even to the majority of Siamese. It is still sparsely populated and indifferently productive. The red, sandy soils or superficial clays are not very fertile, the rain-bearing winds are robbed of most of their moisture before they have crossed the rim so that the rainfall is low. There is little timber of value in the thin scrub (the pa-deng of the Siamese, equivalent to the indaing of Burma) which covers much of the land; and the huge swamps which, owing to defective drainage, form during the rains despite the low rainfall encourage the growth only of grass and reeds. Damp and muddy for half the year; hot, dusty, and dry for the remainder, life is hard and the region has been specially liable to epidemic diseases of men and animals. The Lao-Khmer population is self-sufficing, growing glutinous rice and other crops for home consumption, but little produce is sold. Included in the region is a narrow strip in the north-east between the edge of the plateau and the Mekong.

South-eastern Siam.—To the east and south-east of Bangkok is a relatively small area. The central part is an extension of the plains of Central Siam but drained by the Srakheo and agriculturally less developed; to the north are the hills which border the eastern plateau and which rise in Don Pia-fai to 4108 feet; to the south lies a mass of tangled, forested hills rising to over 3400 feet and cutting off the plain from the sea. Through the heart of the plain runs the railway from Bangkok through Shajeungdhrao (Petriu) to Aran Pradhet (Aranya Prades) on the 1940 boundary. Shortly before the old boundary is

reached the railway passes through dry forest country over the low, almost imperceptible divide to the Cambodia basin. From railhead on the 1940 boundary a good all-weather motor road, built by the French, runs to Siem Reap with its huge French hotel and modern shops. Just to the north are the ruins of Angkor, just to the south the great lake of Tonle Sap with its interesting fisheries. Most of this country is now reincorporated in Siam.

Southern Siam.—This region comprises most of the narrower part of the Malay Peninsula. From the latitude of Bheja Buri (Pechaburi) southwards to the Isthmus of Kra the peninsula is shared with Burma and the boundary lies along the crest of a central ridge. In parts the strip falling to Siam is not more than 10 miles wide and the land rises steeply from the sea to heights of over 4000 feet (4520 in Khow Hluang). Southwards Siam occupies the whole width of the isthmus, 70 miles or more in the latitude of Nagorn Sridharmraj (Nakawn Sri Tamarat). Generally it is mountainous, but there are considerable plains from which the hills, especially those of limestone, rise precipitously. With a more equable and higher temperature, a higher humidity and rainfall, and but a short dry season, Southern Siam is a land of evergreen forests which clothe thickly all the hills, of rich crops of rice, and considerable herds of cattle. It contrasts markedly with North-eastern Siam and is a smiling land of "cerulean blue water, golden beaches, villages nestling amongst tall palmtrees, miles of rolling evergreen jungle behind these, and, at the back of all, magnificent purple mountains towering into the sky" (Graham). The land is rich and yields its crops with little trouble, the neighbouring seas are teeming with fish, and the country is comparatively free from disease. The people are Buddhist Siamese (Thai) except near the Malayan border where they give place to Muslim Malays. Here is most of the mineral wealth of Siam, the tin and tungsten. The railway from Bangkok to Singapore runs for nearly 600 miles through Siam, and is well served by the justly famous International Express. In the south, near the Malayan border, where the rainfall is high and the dry season short, rubber plantations replace tracts of evergreen forest, but about 100 miles from Bangkok, along the shores of the Gulf of Siam, is a sheltered belt with a low rainfall. This has been developed as a Riviera by the Siamese, with its centre at Hua Hin, where a Royal Palace in Italian style, a comfortable European-style hotel, and many bungalows among the coconut palms of the golden strand offer striking contrasts to the old fishing and boat-building villages nestling behind rocky headlands.

The climate of Siam closely resembles that of Burma or parts of southern India, but the whole country being nearer the equator the range of temperature is less, even in the north. The cool season, which is also dry over most of the country, extends from the end of October or early November to February and is marked by sunny skies and cool light winds from the north or north-east. The hot season (also dry) is from about mid-February to the end of April or early May. Along the coast land and sea breezes mitigate the heat: hence the popularity of Hua Hin; but elsewhere there is little movement of the air. The rainy season extends from May to October, the season of the south-west monsoon in India, and the winds blow mainly from the south. In

Buddhist temple, Siem Reap

Bangkok: typical 'klong' lined with warehouses

Snake farm connected with Pasteur Institute, Bangkok

Central Siam: experimental tractor ploughing riceland

the south—Peninsular Siam, there are really only two seasons, the Rains which are prolonged to the end of the year or later and the hot weather from about February to August, but the hot season is far from rainless. In itself the climate of Siam is not unhealthy but needs to be treated with respect. Protection from the sun is always needed.

The three main sources of disease are, apart from heat stroke, water, food, and mosquitoes. Bangkok is alone in having a proper piped water supply; elsewhere water needs to be filtered and boiled. As usual in tropical countries uncooked vegetables and soft fruits of which the skins have been broken are dangerous. It is impossible to avoid being the target of mosquitoes, and every visitor to Bangkok knows the amusing custom of the hotels in providing cotton sacks about sundown into which both feet can be put. Various light fevers are prevalent.

With this sketch of the geographical background, we may turn to the story of recent developments in Siam, up to the outbreak of war. Modern Siam owes much to its Royal Family. Rama IV (1851–68) was a remarkable man who came to the throne after twenty-seven years as a Buddhist monk, during which he had taught himself not only Pali but also Latin and English. He it was who first really opened the country to foreign trade and regulated foreign relationships by treaties. It was however during the long and successful reign of King Chulalongkorn or Rama V (1868–1910) that Siam gradually became a modern state. Feudalism and debt-slavery were swept away and a civil service established: post and telegraph services were organized in 1885, railway construction commenced in 1891. The army and navy were reorganized and an efficient force of gendarmerie established. The consolidation of the Thai people clashed with French colonial interests and Siam was forced to cede the Cambodian provinces in 1907. Rama VI (1910–25) carried on the work of modernization, introducing family names, the Boy Scouts, and pressed on with large irrigation works. Siam declared war against Germany in 1917 and sent a token expeditionary force to Europe in 1918. In the latter year through railway communication was established with Malaya.

On his accession in 1925 King Prajadhipok immediately established a Supreme Council of State to advise him and a Legislative Council of forty members, but the progress was not fast enough to please the reformers. A *coup d'état* ended the absolute monarchy in 1932 and the king granted a new constitution. He refused however to give up certain prerogatives and abdicated, from England, in 1935. He retired to a house near Virginia Water and died on 30 May 1941. His nephew, Ananda Mahidol, was only nine years old when he succeeded in 1935 so that the royal power passed to a Council of Three.

Although the Portuguese, in 1511, were the first European nationals to establish trading relationships with Siam, the British have been the dominant foreign influence in the country for more than a century. At first negotiations were difficult because Britain was trying at the same time to establish friendly relations with the Burmese, the hereditary enemies of Siam. It was not till war broke out between Britain and Burma that the first treaty with Siam was signed, in 1824, followed by a trade treaty in 1825. It was an English colonel

who introduced the printing of Siamese characters, Americans who brought the printing press to Siam in 1836. The next fifty years saw a steady growth of British influence. The railway era in Siam was, for example, initiated by British surveys, both unofficial and official, in the 'eighties. The Paknam Railway Company Limited was incorporated in 1891 and its short line from Bangkok to Paknam opened in 1893. In the meantime the first sod of the northern line had been cut by the King in 1892. The contract for this line was given to an Englishman, but his unsuccessful German rival was made director of the Royal Railway Department to control the work, with the result that nothing was completed till the Government took over in 1896–97. From this time onwards the Germans sought to establish a greater influence, but with limited success. The French had some influence, especially in legal matters, but owing to rivalry in Cambodia there has not been the same friendly relationship between Siam and France as between Siam and Britain. As in so many countries Japanese traders established a firm hold during the world war of 1914–18. Although both Japanese trade and political influence waned later, they remained important. The concept of Asia for the Asiatics came to Siam from China in the 'twenties and resulted in the termination of the agreements between Siam and many foreign advisers, including a majority of British; there was a steady move towards control of all phases of national life by Siamese, and restrictions were imposed on foreign institutions such as missions and mission schools. The Japanese sought to further their influence by opening "information bureaux" and travel or commercial agencies, but by 1938 many of these were closed, and one would have said that Japanese influence was markedly on the decline, while friendship and respect for Britain remained high.

In 1940, on the collapse of France, war broke out between Siam and the French forces in Indo-China, especially in the far north-east along the Mekong. It was a desultory affair and an armistice followed the offer of Japan to arbitrate. Siam received those areas west of the Mekong in the north-east, and the provinces of Cambodia which she had long regarded as integral parts of the Siamese kingdom. It is thus scarcely surprising that Siam did not resist the Japanese invasion but took the easy course. It has however surprised the many British friends of Siam that the Siamese should have joined the Japanese forces in their attack on Burma. It may be that the age-old hatred of the Burmese has more influence here than any intense feeling against Britain.

Turning now to material progress, first place must be given to the development of communications. In 1896 the Government launched itself on a railway career by taking over both construction and direction, and the Royal State Railways of Siam have become the largest commercial undertaking in the country, with a capital expenditure of over £20,000,000 and a remarkable record of profitable working. The lines now radiate from Bangkok.

The northern line to the old capital of Ayuthia was opened in 1897; extended in 1900 to the north-east through the mountain rim of the Korat plateau to Korat, known as the North-eastern line. The northern line was pushed steadily northwards, reaching Denjai (Den Jaya) at the foot of the hills of northern Siam in 1909, and completed through the very difficult mountain country to Jieng Hmai in 1921. Jieng Hmai is 410 miles from

Bangkok and is reached by passenger expresses in a little over twenty hours. The completion of this line led to a decree to extend the north-eastern line right across the Korat plateau to Warindra, opposite Ubon on the Nam Mun near its junction with the Mekong. The final stage of this line was practically complete in 1939: it is definitely a pioneer line, designed to open up sparsely inhabited country previously little known and difficult of access. The same is true of the branch from Korat to Khon Khen (Khonkaen), designed to be extended to Nong Khay (Nonkai) on the Mekong itself near Vientiane.

The eastern line from Bangkok passes across fertile rice-lands to Shajeungdhrao (1908) and in 1926 was extended through scrub forest to the pre-1940 boundary at Aran Pradhet, 158 miles from Bangkok.

The story of the fourth main line, the southern line, is an interesting one. Whilst the Menam Chao Bhraya is a great water highway, it cuts off Bangkok, which lies on the east bank, from land communications with the west. Consequently from a terminal point (Bangkok Noi) near the river bank opposite Bangkok a line was begun in 1900 through Nagorn Pathom (Nakon Patom) and Rajburi to Bheja Buri (94 miles), and despite difficulty in bridging several large rivers was completed in 1903. In that year Siam floated the first foreign loan of £1,000,000 for work on the northern line, and this was a precedent for the loan from Britain of £4,000,000 for constructing the southern line, which was part of the agreement of 1909. In a country of heavy rainfall, tropical forests interspersed by swamps, and crossed by irregular hills, the construction of the southern line was not an easy task, but it was completed to the Malayan border in 1917, through running with the F.M.S. Railways beginning in 1918. The journey of over 700 miles from Prai (Penang) to Bangkok takes twenty-six hours. A second connection between the Siamese and Malayan railways, nearer the east coast, was made later.

The Malayan railway system is metre gauge and the southern line of Siam was constructed as a single-line metre gauge. Unfortunately the other lines of Siam had been built on the standard European gauge of 4 feet $8\frac{1}{2}$ inches. The Government decided on a bold and far-sighted policy: of bridging the Menam, making one main terminus in Bangkok, and converting the whole system to metre gauge. The older Siamese considered the bridging of the Menam a dangerous insult to that sacred river, but operations, entrusted to a French firm, began in 1922. The magnificent steel and ferroconcrete bridge (Rama VI Bridge) was opened on 1 January 1927 so that all trains now run to the fine central railway station (Hua Lampong) with a semi-circular single-span roof and with a European-type hotel attached. The expresses on the southern line are hauled by Diesel-electric locomotives for at least part of the journey. These were introduced to Bangkok largely because of the long haul for bulky wood fuel to the capital The wood-burning steam locomotives on other lines are Baldwins (U.S.A.) or Hanomag (German).

Thus by 1 January 1938 the railway system comprised 1925 miles of metre-gauge line, and in the year 1936–37 nearly two hundred locomotives hauled 1,590,000 tons of goods and over $5\frac{1}{2}$ million passengers nearly $7\frac{1}{2}$ million train-kilometres. Only thirty-five passengers have been killed in twenty-four years. The only private line, the Paknam Railway, was purchased by the State in 1936.

In a country where the capital is in the midst of rice plains liable to flood for nearly half the year, it is scarcely surprising that little attention was given to roads. Except for feeders to the more remote railway lines, the Government policy was directed to railway construction and was opposed to roads which might take traffic from them. Thus in the third edition of 'Siam,' published in 1924, Graham could say "outside the town of Bangkok there are very few made roads anywhere in Siam and none at all in the central part." There was only one metalled road, from Jieng Rai to Nagorn Lambang, in the whole of northern Siam. In southern Siam there were then about 600 miles, unmetalled, but with wooden bridges built largely as "acts of merit" by pious Buddhists. The famous old routes between Siam and Burma, notably Moulmein–Raheng and Mergui–Bheja Buri, were merely jungle tracks. An official map, illustrating the 1930 volume 'Siam, general and medical features,' shows only the one metalled road Nagorn Lambang–Jieng Rai (State Highway No. 3) north of Bangkok, a motor road from Bangkok to Kanchana Buri (Kanburi), and a number near the Malayan border. In 1936 a new start was made with roads when the Government sanctioned an eighteen-year programme for the construction of 9000 miles of roads at a cost of 153,000,000 baht (about £14,000,000). Nearly 2000 miles were allotted to the five years beginning 1 April 1936, notably many in the far north leading to the boundary with the Shan States; from railhead at Sawarngalok through Raheng to the Burmese border, connecting with the road to Moulmein; from Kanchana Buri to the Burmese border at Bhra Chedi Sam Ong (Three Pagodas); from Shajeungdhrao to the north-west shores of the Gulf of Siam; and from the north-eastern line to the Mekong.

The use made of these roads in the recent campaigns against France and Burma needs no comment. It may be said that a road policy was forced on the country by the advent of motors. In 1937–38 there were already 11,439 licensed motor vehicles (4233 lorries), and bicycles had increased from 3211 in 1920–21 to 54,220 in 1937–38. In the latter year there were no fewer than 11,437 of the popular one-man-power tricycle taxis. The most popular motor vehicle is a high-powered American car which can be consistently ill-treated and overloaded with both goods and passengers. The rule of the road is to the left; petrol in 2-gallon cans is available wherever there are roads. Most of the private cars are in Bangkok.

Bullock carts and buffalo carts are still universal outside Bangkok for transport of goods, but the smart bullock carriage is now an extreme rarity. The carts are locally built, usually by the villagers who own them, except for the wheels, which are made by the village wheelwright. Pack bullocks have also almost disappeared from the Korat plateau where they were largely used; elephants far from being the efficient beasts of burden commonly supposed, though ideal for work in the timber industry, are now little seen outside the teak forests; human porterage is still normal on mountain paths.

Despite the construction of railways it is probably still true to say that at least 80 per cent. of the produce of the country is carried to market by water. Siamese children living, as most of them do, in the heart of the country, learn to swim almost before they can walk and the whole population is familiar from earliest youth with the management of boats of all kinds. In recent

years motor launches and steam launches have been steadily ousting the country boats, and in 1936–37 there were licensed 230 private motor launches, 1366 motor launches for passenger service, 318 steam launches, as against 63,649 licensed cargo boats.

The first public air-transport service inside Siam was inaugurated in June 1922. The Aerial Transport Company of Siam took over the civil lines in August 1931 and many routes were in regular operation by 1937. Bangkok of course was served by international services of Imperial Airways, thrice weekly in each direction; K.L.M., also thrice weekly; and Air France.

By 1938 or early 1939 there were over seven hundred post and telegraph offices in Siam and the public wireless service with foreign countries was inaugurated in 1929, the radio-telephone service (first with Berlin) in 1931, a radio-picture service in 1933, and a broadcasting service, since greatly extended, in 1931. However, with a length in 1936–37 of telegraph lines only five times, and a length of telephone lines only just equal to the north–south length of the country, it is clear that only main places are yet served.

Nine-tenths of the people of Siam are concerned in one way or another with rice, its growing, marketing, milling, or export. It is the country's principal product, the people's staple food, and forms 70 per cent. of the country's exports. Its price controls the purchasing power of the whole country in international trade. Rice for human consumption is eaten cooked with various other items of food such as fish, but these are rather to be regarded as garnishings to the main dish of rice. It is made also into cakes, sweetmeats, and puddings. The distillation of the rice liquor *lao rōng* is a Government monopoly.

In rice cultivation there is still the curious blend of the old and new in Siam. The opening of the ploughing season is the occasion for the religious ceremony of Raek Nā (first field or first ploughing) formerly presided over by a high dignitary of the State and in modern times by the Minister of Agriculture. The plough, bullocks, and seed are blessed by the Buddhist priests and a specially decorated field ploughed with a triple furrow all round. The implements normally employed are simple and primitive; they include a plough made of hardwood tipped with a triangular piece of iron, and a harrow which is really a large rake with hardwood teeth, both drawn by buffaloes. Yet tractors have already made their appearance on Government farms and a special light plough for heavy soils, designed by a Minister of Agriculture. The peasant has no money for the purchase of elaborate implements, but with the help of cooperative credit schemes mechanical pumps are replacing the old water-wheels of the tread-mill type.

The one thing essential for rice is a constant supply of water at the right time. In areas of low rainfall this can only be secured by irrigation; in areas of moderate rainfall irrigation is needed as an insurance against crop failure in a year of poor rain; in areas of good rainfall irrigation permits control of water and its utilization to the best advantage. Comprehensive works were planned by Sir Thomas Ward, of the Government of India, and the first of his schemes put in hand in 1916 and completed in 1922. The cost with Chinese coolie labour would have been prohibitive; it was made possible by

mechanical excavators imported from the United States. Other large works are in hand. At the same time a soil survey (under an Englishman, Mr. Pendleton) and research into many aspects of agriculture have been actively fostered. The Siamese being Buddhists have little interest in animals except as field animals or draught animals.

It is impossible to deal in this brief account with the development of mining, at present largely restricted to tin in the south but with great possibilities; or with the growth of scientific forestry, now extending beyond teak, the staple timber; but since so much of the recent progress in Siam is directed from Bangkok, it is fitting to end by some account of the capital.

Bangkok is the only large modern city in Siam and has now a population approaching a million. Even as late as the latter part of last century there were no streets in Bangkok, the sole means of communication being by boat or on elephant-back along tracks which were soft mud when the tide was out and runnels of water when it was in. Nearly all the streets of the capital have been made since 1895, and Bangkok has ceased to be "the Venice of the East," though the canals or *klongs* penetrate to all parts of the city and on the opposite side of the Menam is a maze of creeks where the famous floating market is held every morning.

There was only a small settlement on its site when King Rama I, after the fall and sack of Ayudhya in 1767, moved his capital to Dhonburi on the bank of the river opposite Bangkok and then, in 1782, decided to build a new capital. At a time when the Burmese were the chief enemies of Siam the site was well chosen on a loop of the Chao Bhraya, with the river as a protection on the north, west, and south, and a vast swampy plain, well called the Sea of Mud, to the east. This nucleus, still dominated by the Grand Palace and Wat Po (most extensive of all Bangkok temples) and with many public buildings and Government offices, was cut off by a canal, the Klong Talad, and so is actually an island. The city grew rapidly to the east and its area had to be doubled. A second canal, the Klong Ong Ang, was used as the new city moat and was reinforced by a third city wall originally with sixteen forts and sixteen gates, of which two are left. Within the line of the old city wall is the City of Bangkok proper; though densely peopled and with a network of streets, one-fifth of the area is occupied by temples and their grounds; and so, with such other open spaces as the Royal Plaza, and with an abundance of trees, it preserves a spaciousness and grandeur which might well be the envy of modern town planners. In the south of the old city is the Memorial or Phra Buddha Yod Fa Bridge erected across the river, the only road bridge, to commemorate the one hundred and fiftieth anniversary of the founding of the city (1932).

In 1851–54 the King had a new city moat dug, the Klong Padung Krung Kasem, but the fortification of it was never completed. The modern railway terminus and the European quarter with the banks and consulates are just outside the city limits set by this *klong*. There has of course been an enormous later extension with such buildings as the Throne Hall, built of white marble brought from Carrara and by Italian masons; the University, an interesting combination of European and Siamese styles; the Hospital, Pasteur Institute with its famous snake farm, and the Race Course and Clubs.

Un
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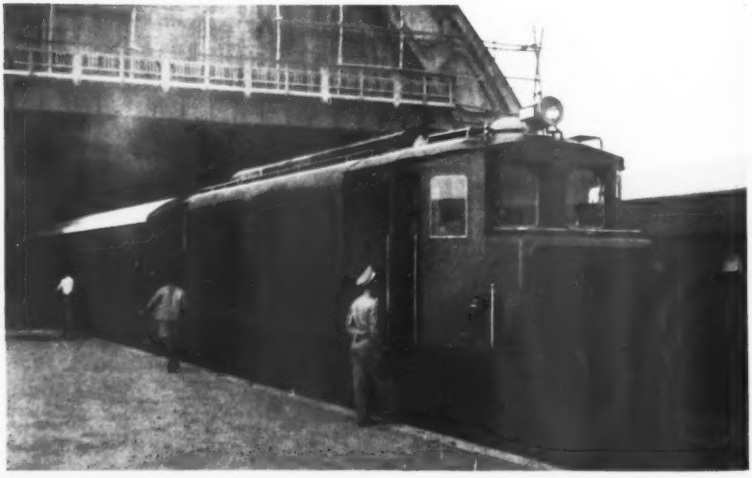
University, Bangkok: combination of Siamese temple architecture with modern European

Royal summer palace near Hua Hin: modern European architecture

Village opposite Bangkok and 'waterbus'

Bangkok: tricycle taxis which have replaced the rickshaw



Bangkok: main station and diesel electric express

Except within the city walls, Bangkok remained practically without roads: most of the space now occupied by roads was used as gardens. The banks of the canals and the river were lined with houses, mostly of wood and on piles driven into the soft mud. A great part of the population lived, as some still do, on house boats. One of the first roads was the New Road leading right into the heart of the city from well down the river. It is not an impressive thoroughfare but many fine avenues lead from it. Many banks and business houses still face the river and have their own landing stages, turning their backs on the road. Nowadays the *klongs* handle the traffic coming by boat from up country or by lighter from the port, and are often lined with warehouses; but the city people use the roads: on foot, on bicycles, in bicycle-taxis, or in buses and trams. The new lay-out is spacious and Bangkok has become a city of great distances. It is possible however to capture the spirit of old Bangkok in the network of creeks just above the city on the opposite bank, in the floating market.

At heart the Siamese are lovers of the land and do not take readily to city life nor to commerce and trade. Consequently the Chinese, who enjoy both the latter, play a large part in the life of Bangkok, and a large proportion of the country's half-million Chinese subjects are found living there.

As the one great city of Siam Bangkok is also the cultural centre. There are now two universities. The Chulalongkorn University founded in 1917 provides courses in Medicine, Arts, Sciences, Engineering, Pharmacy, Architecture, and Veterinary Science. The University of Moral and Political Sciences was founded in 1933–34 with the special object of developing the studies needed for the civil service. The system of schools embraces the old monastic village schools and has woven them into a complete state scheme. Not only have the village Buddhist monks long had the training of the young, but Buddhism has dominated and still dominates daily life as well as art, architecture, and literature. Much of the cultural life of the nation has thus a religious background.

Recent developments in medicine call for special mention, notably the nursing service encouraged by the late Queen. Vaccination was introduced by American missionaries as long ago as 1837, and smallpox is now rare: cholera epidemics, once the scourge of the country, may break out at intervals as in 1919 and 1925–26. It is only during the present century that plague has become established through the Far East and the scourge of venereal diseases. Malaria is still the greatest single destroyer of the human race, though hookworm and various intestinal diseases are widespread, and Siam does not escape the influenza epidemics. Disease is fought from headquarters in Bangkok. Doctors graduate from the University and are members of the Siamese Medical Association, founded in 1921 on the lines of the B.M.A. There are health officers in each important centre, and the foci of hospital work are the King Chulalongkorn Memorial Hospital (1911) and the older Siriraj Hospital (1889).

Bangkok is the only modern port of Siam. The port may be said to extend all along the 25 miles of the river up to the Memorial Bridge. Owing to the bar at the mouth only vessels drawing 13 feet could ascend the river and the outpost was the island of Koh Si Jang. But a contract for enlarging the port

was placed with a firm of Danish engineers in 1938, and a dredger bought from Holland to dredge a channel across the bar 26 feet deep. Of the thousand foreign vessels of 1,000,000 tons visiting the port annually before the war 30 per cent. (by tonnage) were British, 30 per cent. Norwegian, 10 per cent. Japanese, and 10 per cent. Danish.

The amusements of this cosmopolitan city of course include European, or rather American, films, Chinese and Siamese films, Siamese theatres and folk plays. Weekly horse races held at the Royal Turf Club are popular with the Siamese and Chinese alike, who are inveterate gamblers; cock-fighting, boxing, kite-flying, and dancing appeal to more limited clienteles. There are three or four leading hotels run by Europeans, two or three hotels frequented mainly by Japanese.

The crowning beauty of Bangkok, indeed the really distinctive feature of the city, are the innumerable Buddhist temples or *wats* with their characteristic Siamese architecture. To those familiar with temples elsewhere, they are remarkable not only for their beauty in detail and setting but also for their scrupulous cleanliness; indeed Bangkok as a whole is a very clean city. The tasteful combination of wood and stone, the use of inlaid work of fragments of coloured glass and china, the beautiful lines of the coloured roofs, the dignified statues of Buddha set off by the clever use of statues of legendary or quaint human beings, not a few of which display a charming sense of humour in their arrangement, all combine to surprise and fascinate, and bring the visitor very quickly to respect the remarkable art and culture of this eastern nation. That English is everywhere the second language and is widely understood in Bangkok makes this appreciation the easier to an English-speaking visitor.

Note on the transliteration of Siamese names

In the past there has been no generally accepted system for the spelling of Siamese geographical names in English and the problem has not yet been considered by the Permanent Committee on Geographical Names for British Official Use. The matter has been given considerable study in Siam, but King Prajadhipok, in reviewing the position a few years ago, voiced the general opinion that a system which would satisfy scholars would be too complex for general use and that a second scheme of conventional names would be needed. However the Siamese Government has attempted to cut the Gordian knot and has made an official pronouncement on the subject (see *Geogr. J.* 98 (1941) 154, 155). In the meantime unfortunately the British Admiralty and the Survey of India had, independently, reached different conclusions. In the 'China Sea pilot,' vol. I (1937) the spellings used are based on the R.G.S.II. system and the Admiralty announced its intention to introduce gradually conformity to that system on the charts which at present have older varied spellings. The Survey of India in a series of maps now being produced for official use is using a different transliteration as well as ignoring the detail given on Admiralty charts. Further the edition of the International 1/M map in English adopts spellings of the Siamese Royal Survey Department.

The names throughout the paper follow the International 1/M sheets; where other forms are perhaps better known these are given in brackets after the first mention of the name.

Some common Siamese words found in place-names

Ao, au	bay, creek	Monthon	province or state
Ban- (B)	village	Muang (M)	town
Dam	black	Nai-kwa	inner
Deng	red	Noi	little, less
Doy	hill	Noi-kwa	lesser
Gao	old	Pak	mouth
Goh (Koh)	island	Pak-nam	river mouth
Hin	stone	Phra-chedi	pagoda
Kau (Khow)	hill	Pom	fort
Khao	white	Pu-khaw	mountains
Klone	mud	Ta-le	sea
Klong	canal, creek	Ta-le-sab	lake
Lang	lower	Tai	Siamese (free)
Lek	small	Tit nua	north
Lem	cape, point	Tit tai	south
Lom	wind	Tit tawan ok	east
Lueng	yellow	Tit tawan tok	west
Mai	new	Wat	temple
Menam	river	Yai	great
(often shortened to Me or Nam)		Yai-kwa	greater

Some Malay names found in the south

Ayer	water	Lumpur	mud
Batu	rock, stone	Negri (Negĕri)	settlement or a country
Bĕsar	large, great	Pulau	island
Bukit	hill	Sĕlat	channel or strait
Itam (Hitam)	black	Sungei (Sungai)	river
Kali (Javanese)	river	Tanjong	cape, point
Kampong	village	Telok	bay
Kuala	river mouth	Tuwak (Tua)	old

The more correct modern form is given in brackets.

Note on books and maps

The best modern book on Siam is Wilhelm Credner's 'Siam: Das Land der Tai' (Stuttgart, 1935) in German: Credner made a number of journeys in 1927–29 and his book incorporates his own observations with an exhaustive study of published work. He gives a number of maps and photographs and a valuable bibliography of three hundred and thirty-six items. The standard book in English is unfortunately older and, in a country where recent changes have been rapid, this is a serious drawback. Nevertheless there is much valuable material in W. A. Graham's 'Siam' (Third edition in 2 vols, London, 1924). On the occasion of the meeting of the Far Eastern Association of Tropical Medicine in Bangkok in 1930 the Government issued two volumes entitled respectively 'Siam, nature and industry,' and 'Siam, general and medical features,' the first edited by the Ministry of Commerce and Communications and the second by the Executive Committee of the Congress. Each is a collection of authoritative articles by acknowledged experts: some specially written, others previously issued in pamphlet form.

In 1931 a Rural Economic Survey, directed by Professor C. C. Zimmerman, was carried out under the joint auspices of the Siamese Government and the International Council of Missions, and an informative report was issued. A

Second Rural Economic Survey, relative to 1933–34, was carried out under the joint auspices of the Government and the University of Harvard and a report issued. Professor Zimmerman summarized some of the chief results in an article "Some phases of land utilization in Siam," in the American *Geographical Review* (21 (1937) 378–393). The most recent book on Siam is Professor P. K. Landon's 'Siam in transition' (London, 1939), a survey of cultural trends between 1932 and 1937.

The Government's Central Service of Statistics issues a voluminous and informative Statistical Year Book (in English and Siamese) which, in addition to statistics, has brief summaries on many aspects of life and industry. The Reports of the British Department of Overseas Trade, issued before the war roughly every two years, also had up-to-date information.

There is in Bangkok a Siam Society, the Journal of which has articles of varied interest in English.

Maps

The topographical survey of Siam is in the hands of the Royal Survey Department (Ministry of War) which issues an annual 'Report on the operations.' Maps are issued on the scales of 1/50,000, 1/100,000, and 1/200,000, but unfortunately all are in Siamese. The most useful series is probably the 1/200,000 based on a modern triangulation. These maps are fully coloured and are contoured; they show the principal types of land use: forest and scrub in green; cultivated land in yellow; rice fields with broken lines; market gardens, coconuts, mangrove swamps, separately shown; as well as the usual details of communications and settlements.

Five sheets of the International 1/M map, in English and Siamese editions, cover the country: they are layer coloured but the information is limited.

DISCUSSION

Before the paper the PRESIDENT (the Rt. Hon. Sir GEORGE CLERK) said: We had expected this afternoon to have a lecture on the "Geography of the Ethiopian campaign" from Colonel Orde Wingate who, as I understand, commanded the military mission which accompanied the Emperor Haile Selassie on his return to Ethiopia. But military duty took Colonel Wingate away again a fortnight ago, and Dr. Dudley Stamp very kindly undertook to step into the breach at short notice with a paper on "Siam before the war," as he saw it during an extended visit in 1938. As a member of our Council he needs no introduction to the Society; which will remember an excellent paper he gave us on the Irrawaddy river.

Dr. Stamp then read the paper printed above.

The PRESIDENT: We are all most grateful to Dr. Stamp for an entertaining and instructive afternoon. Speaking personally, I was, first of all, particularly interested in his pictures of a country where I might have spent my life. When I was about to come down from Oxford Sir Robert Morant had just returned from being tutor to the young Crown Prince of Siam, and I nearly went out there as Sir Robert's successor. Indeed I should have gone had he not said to me: "If you want to do your job you had better look out for your coffin," so I thought I would not go.

In conclusion I should like, on your behalf, to record our thanks to Dr. Stamp for giving us a most delightful lecture.

THE CAUCASIAN BORDERLAND

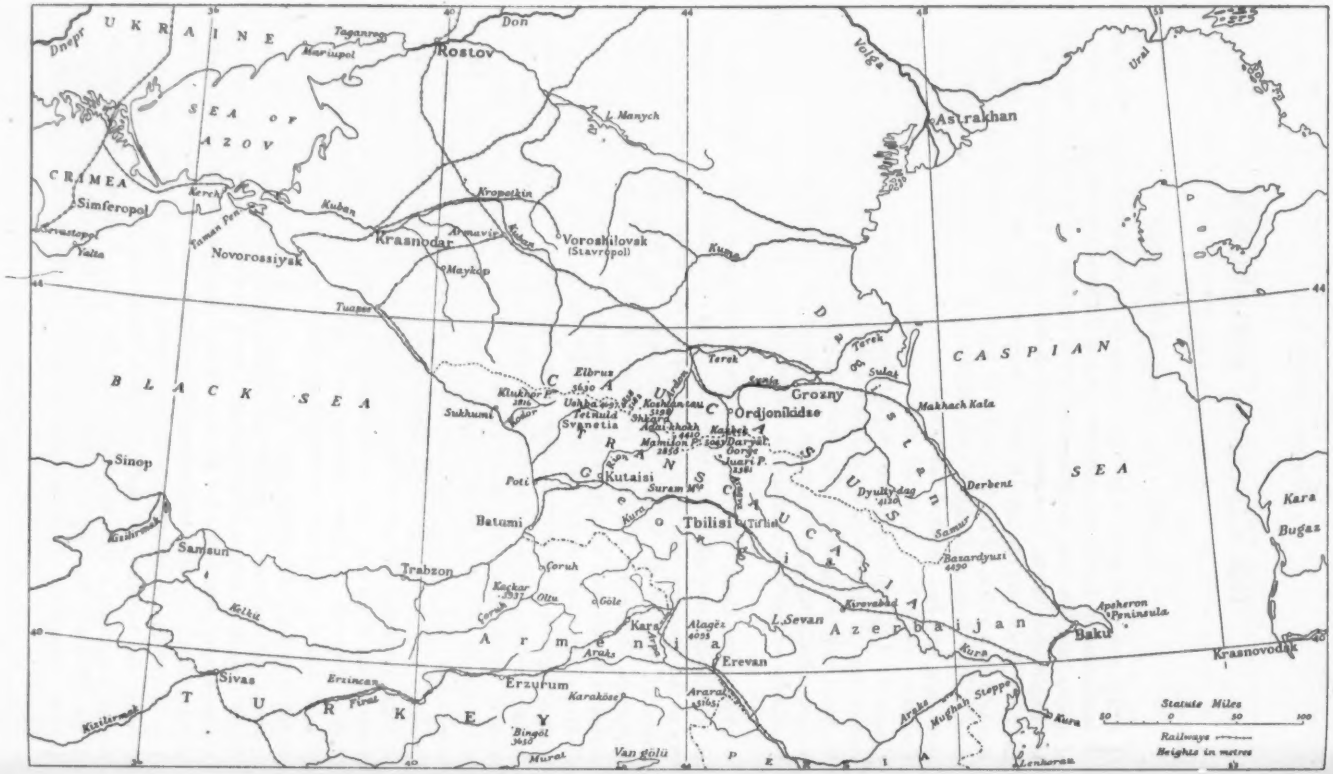
W. E. D. ALLEN

Meeting of the Society, 4 May 1942

I FEEL some diffidence in giving a lecture on an area which has in the past been associated with the names of some of the most distinguished Fellows of the Society. The late Douglas Freshfield is perhaps one of the best known, his 'Exploration of the Caucasus' is the classic for the Central Range. The late Lord Bryce and the late H. F. B. Lynch, writing fifty years ago, remain standard authorities, for the geography of Ararat and the Armenian highland zone. Lastly, John Baddeley, a Gold Medallist of the Society who died two years ago, had just finished his two volumes on Dagistan and the central Caucasus which have appeared under the title of 'The rugged flanks of Caucasus.' I should like here to pay a tribute to a man who was the perfect combination of the adventurer and the scholar. All his friends will remember his noble and benign aspect, his profound erudition, his generosity, and his wisdom. Baddeley was, I suppose, the last of the Victorians, who laid the foundation of modern geographical knowledge.

Throughout history Caucasia has been a borderland. The main chain of the Caucasus mountains, stretching from the Taman peninsula on the Azov Sea to the Apsheron peninsula on the Caspian Sea, is the natural limit of the mountain zone of the Middle East comprising the Armenian and Iranian highlands, themselves a westerly extension of the Himalayan system. Right across Asia this vast mountain complex forms the watershed of the rivers flowing north to the Arctic and south to the Indian Ocean and divides two worlds opposed in all natural and human phenomena. Where the mountain barrier narrows, along the line of the Kopet Dagh (N.E. Persia) where the Iranian plateau falls to the sandy steppe of Central Asia and in the region of the Caucasus, the two worlds come into close contact and both areas have always been the scene of constant friction and interplay of forces and influences. In the past, from the middle eastern world Iranian and Islamic cultural influences and armies have overflowed into central Asia as far as the Dzungarian Gap and the borderlands of China. Conversely, Northern Asiatic elements: Turkish, Mongol, and, finally, Russian, have burst or filtered over the mountain barriers of the Caucasus and Kopet Dagh to the west and east of the Caspian Sea.

In the north the slopes of the main chain of the Caucasus descend to the North Caucasian steppe. This steppe is in its westward part a projection of the grasslands which are fed by the rivers flowing to the Black Sea. The Kuban, like the Don, belongs essentially to the Pontine river system. The low hills of the Stavropol ridge, stretching north to Manych, form the divide between the western and eastern steppes. Eastward, the North Caucasian steppe disappears in the sandy flats stretching to the Volga and forming part of the old bed of the Caspian Sea; an extension of the arid zone of the Aralo-Caspian depression. This steppe is typical of the desiccated desert lands of


UKRAINE
Dnepr
Taganrog
Mariupol
Rostov
Don
Volga
Ural
SEA OF AZOV
CRIMEA
Simferopol
Kerch
Yaman Pass
Kuban
Kropotkin
Sevastopol
Yalta
Novorossiysk
Krasnodar
Armavir
Kuma
Voroshilovsk (Stavropol)
Maykop
Tuapse
Terek
Sulak
CASPIAN SEA
BLACK SEA
Elbrus 5630
Grozny
Ordjonikidse
Makhach Kala
Sukhumi
Svanetia
Kutaisi
Sinop
Poti
Batumi
Kizilirmak
Samsun
Tbilisi
Derbent
Dyuktydag 4150
Kara Bugaz
Trabzon
Coruh
Bazardyuzi 4490
Kelkit
Kagyzman
Kirovabad
Apsheron Peninsula
L. Sevan
Azerbaijan
Baku
Erevan
Araks
Kura
Krasnovodsk
Sivas
Erzincan
Erzurum
Karakose
Firat
TURKEY
Kizilirmak
Bingol 3650
Mush
Van Gölü
Araxes
Mughan Steppe
Lenkoran
Statute Miles
Railways
Heights in metres

Asia north of the Mountain Heart and, appropriately enough, is inhabited by the nomad Mongol-speaking Kalmycks.

In Transcaucasia, south of the main chain, the same diagonal division is reproduced. The Little Caucasus (Suram Mountains), thrown off at right-angles from the main chain, form a ridge 1525–1830 m. (5000–6000 feet) linking the Great Caucasus with the Armenian highlands. To the west of the Suram mountains, the Rion basin is an emerged part of the bed of the Black Sea and belongs to the climatic and natural world of the Pontus. East of the Suram mountains the valleys of the rivers Kura and Araks, coming down from the high plateau of Armenia, flow through the arid steppe of Azerbaijan which forms, as does the Kalmyck steppe to the north of the main chain, a part of the Aralo–Caspian depression.

The ranges forming "the peripheral rim" [1] of the Armenian plateau run parallel with the main chain of the Caucasus in a general direction north-west–south-east. These ranges form extensive upland plateaux averaging 2135–2435 m. (7000–8000 feet). Rising above the level of the plateaux are isolated massifs, like Alagëz (4095 m.) and Ararat (5165 m.). This peripheral rim of the Armenian plateau is cut through by the valleys of the Kura and Araks, flowing into the Caspian, and the valley of the Çoruh falling to the Black Sea. These valleys, and their affluents like the Oltu-cay and the Arpa-cay, form natural transverse ways into Asia Minor and they connect, by relatively easy passes, with the great river valleys flowing west and south-west as, for instance, the affluents of the Euphrates and the Kelkit-su.

The main chain of the Caucasus mountains consists of a series of parallel ridges. These ridges are linked by necks forming cols which give access from north to south of the main chain. The connecting ridges often form wide upland glens, sometimes at a great elevation. A typical example is Upper Svanetia and the Tush and Khevsur glens in the Eastern Caucasus. Here communities have lived in almost complete isolation for many centuries.

The main granitic backbone of the Caucasus range runs as a single wall right across the Caucasian isthmus, from sea to sea, and separates the basins of the rivers of the northern slope from those of the southern slope. It thus represents the main transverse water-divide of Caucasia. The overlapping parallel ranges are all shorter in length than the main chain, but the principal parallel range of Bokovoy (which means in Russian "flanking") is higher than the main chain and gives rise to some of the most notable peaks of the Caucasian system, namely, Mounts Elbruz (5630 m.), Koshtan-tau (5198 m.), Kazbek (5043 m.), and Adai-khokh [2] (4410 m.). The peaks of the Bokovoy generally exceed in height those of the main chain, namely, Ushba (4697 m.), Tetnuld (4858 m.), and Shkara (5182 m.).

The Western Caucasus, under the influence of the moist climate of the Black Sea basin, is heavily forested, and the snow-line is considerably lower than in the eastern mountains which come under the desiccating influences of the Aralo–Caspian depression.

There are three main lines of access over the main chain from north to south. First, the Black Sea coast road. This is an artificial route which has

[1] H. F. B. Lynch, 'Armenia: travels and studies,' 1901.

[2] Tau (tor) and Khokh (hoch) are Indo-European (Ossetin) toponyms.

only been developed during the last century. A motor-road and a railway have been built by the Russians along the line of the Black Sea coast from Novorossiysk to Kutaisi in Georgia.

The second is the Georgian Military Road from Ordjonikidze (formerly Vladikavkas), in the Northern Caucasus, to Tbilisi (Tiflis). This route follows up the valley of the Terek, crosses the main ridge by the col of Krestovy (2381 m.), now known under the Georgian form Juari ("Cross"), and runs down the valley of the Aragva to its junction with the Kura above Tbilisi. It passes through the gorge of Daryal,[1] as celebrated in the history of the Middle East as the famous Cilician Gates through the Taurus. It was only at the end of the eighteenth century that the Georgian Military Road became a practical highway, when General Todleben, the conqueror of Berlin, crossed the pass with two battalions and four guns. The Caspian coast route has always been the historic highway along which armies have marched from north to south or south to north.

The third route follows the sandy foreshore of the Caspian between the foothills of the Dagistan mountains and the sea. The narrowest point between the mountains and the sea is at Derbent [2] where the gap is about 10 kilometres in width.

There are other passes over the Caucasus, the best-known of which are the Mamison (Ossetian Military Road) which connects the upper valley of the Ardon, a tributary of the Terek, with the valley of the Rion, and the Klukhor pass (2816 m.) connecting the valley of the Kuban with that of the Kodor. There are at least seventy other tracks and paths across the main chain, some of which are only suitable for men marching in single file and others for pack transport. In many cases they are blocked by snow except for three or four months a year.[3]

History

The Caucasus, historically, was the outer edge of the world of the old settled cultures of the Mediterranean and the Middle East. Kingsley has well imagined the ancient conception of the Caucasus in 'The Argonauts': "And at day-dawn they looked eastward, and midway between the sea and the sky they saw white snow-peaks hanging, glittering sharp and bright above the clouds. And they knew that they were come to Caucasus, at the end of all the earth: Caucasus the highest of all mountains, the father of the rivers of the east. On his peak is chained the Titan, while a vulture tears his heart, and at his feet are piled dark forests round the magic Colchian land."

The Caucasus mountains constituted a formidable barrier to armies and to

[1] Dar-i-al = Persian *dar-i-alan* = The Alans' Gate. The mediaeval Alans are to be identified with the modern Ossetins, who call themselves *As* or *Iron;* they gave their name also to the Azov Sea = As-ov = Sea of the As; *cf.* also the Arab name for the Caspian: Bahr-ul-khazar = Sea of the Khazars.

[2] Derbent = Persian *dar-band* ; Arab *bab-al-abwab* = gate of gates.

[3] Baddeley, 'Rugged flanks,' vol. I, pp. 125 *et seq.*, notes two practicable routes in the area between the Mamison and Daryal passes: R. Fiag-don via Khiliak and Rok passes to upper valley of Liakhva; R. Ghizel-don, Resi pass (12,533 feet), Upper Liakhva. East of the Georgian Military Road, animal transport can by-pass the Daryal by the difficult route up the R. Assa and over the Arkhotis pass (*op. cit.*, pp. 168 *et seq.*).

travellers. At the same time, the two marine basins, the Black Sea and the Caspian, gave access to the unknown hinterland beyond the Caucasus. From the seventh century B.C. the Greeks were developing a colonial empire round the shores of the Black Sea. The Greeks themselves were probably the heirs of an earlier Minoan thalassocracy in the Black Sea basin, and there is much evidence that an advanced Bronze Age culture flourished in the valley of the Kuban, and probably also in the Transcaucasian valleys.[1] In the time of Herodotus the Aorsi had already become wealthy as the tribe controlling the porterage between the Volga and the Don and they seem to have been the first predecessors of the Khazars and later Volga powers. But it was only with the rise of the Caliphate that the Arabs developed a great transit trade from south to north across the Caspian, comparable in extent and influence with the Black Sea trade of the Greeks.

The Khazar and Bulgar states, which arose along the Volga and the Kama from the eighth century onwards under the influence of the Arab world, are comparable in character with the Russian river states which were rising along the Dnepr and W. Dvina at the same period under Byzantine and Scandinavian influences. Everywhere civilization was penetrating from the inland seas by way of the great waterways across the vast Eurasian plain. The Khazar state, on the Lower Volga, was the first of a series of Volga powers. The Khazars were replaced by the Kipchaks, and the Kipchaks by the Mongol Golden Horde. Finally, Muscovite Russia appeared as the latest and greatest of the Volga powers.

Muscovite Russia, which emerged in the fifteenth to sixteenth centuries in the area between the Upper Don and the Volga, was a synthesis of the two old and passing worlds of orthodox Byzantium and the Islamized Tartar-Mongols. Muscovy, a state and civilization arising out of the riverlands of the Eurasian plain, was an entirely new historical phenomenon which was destined to modify and transform neighbouring and older societies.[2]

Before they became a European power (on the Black Sea and the Baltic) the Muscovites mastered the great Eurasian rivers: northern rivers like the Pechora flowing to the Arctic, and the Volga, along which the older Asiatic powers had established themselves as the overlords of the whole Eurasian plain, and down which the Russians were destined to advance towards all the lands of the Middle East and Central Asia. Chief instrument in this Russian advance from the region of the Upper Don and the Middle Volga to the Caspian Sea and the Caucasus, and in the west down the Dnepr to the Black Sea, were the Cossacks: communities of men with many purely anarchic tendencies but serving military and colonial ends, a peculiarly original manifestation of the Russian genius.

By the end of the sixteenth century the Russians had finally established

[1] See my 'History of the Georgian People,' and various articles in *Eurasia Septentrionalis Antiqua*, vol. VII. This early Caucasian culture may well have belonged to the same cultural world as Anau (Transcaspia) and the Sumerian and Indus civilizations. This Caucasian culture was doubtless devastated by the *Völkerwanderung* at the end of the twelfth century B.C.

[2] This rise of Russia as a trans-continental power is comparable to the rise of America in the following centuries. The emergence of these two vast and new powers transformed the old world of "local" European and Asiatic relationships.

their power on the Volga and defeated the great Turkish attempt to fight off their progress to the south (1570). During the following century the Don Cossacks were challenging Turkish control of the Azov Sea, and on the Caspian shore the Terek (Tersky) Cossacks had set up forts along the Terek and the Sunja where they came into conflict with the formidable Muslim tribes of Dagistan.

In 1722, the state of civil war in Persia encouraged the Emperor Peter to attempt the conquest of the Caspian coasts. The first regular army trained on modern European lines to operate in Caucasia was transported by sea from the mouth of the Volga to the Terek, and Peter, with no great difficulty, occupied all the country as far as the Khanate of Kuba to the north of Baku. Russian troops were also landed on the southern coasts of the Caspian in the Persian provinces of Gilan and Mazanderan. Unfavourable weather conditions on the Caspian and the outbreak of epidemics checked further progress, and the death of Peter, followed by changes in Russian policy, and later the rise of a powerful military dictatorship in Persia under Nadir Shah, delayed Russian expansion round the Caspian coasts for half a century.

The campaign of 1722 had however demonstrated the practicability of a relatively rapid advance along the Caspian flank of the main chain of the Caucasus, particularly when this operation was carried out by combined sea and land manœuvres. The Russians eventually achieved their conquest of Caucasia by a great flanking movement directed from the Lower Volga across the Caspian to the basins of the Kura and the Araks. They thus in effect turned the main chain of the Caucasus, and it was only after their conquest of Transcaucasia that they turned to the pacification of the tribes inhabiting the main mountain massif.

Ethnology

Caucasia has always been both a refuge of nations in flight before new conquerors and a reservoir from which human elements have emerged to mingle with the populations of neighbouring lands. Many remnants of the old Asianic cultures of the Middle East are to be found in Caucasia.

The *Cherkess*, or Circassians, of the Black Sea coast represent a stock formerly much more widely distributed. Cherkess place-names are found in many parts of the Ukraine in such forms as Psiol and Kremenchug. The Cherkess remained an important element in the population of the Crimea until the eighteenth century, and they occupied most of the north-western Caucasus and the basin of the Kuban until the Russian conquest in the middle of the nineteenth century. Old Russian documents frequently refer to the Cossacks as Cherkess, and there was obviously a substantial substratum of Cherkess blood in the very mixed population of the Northern Caucasus and the Black Sea coast lands as far west as the Dnepr. (Compare Kluchevsky's work showing that there is an important substratum of Finnish blood in the populations of the Volga basin and North Russia). But that is only one aspect of the remarkable dispersion of these people. Professor Zakharov and Professor H. R. Hall have produced evidence for the belief that Caucasian elements were represented among the "Peoples of the Sea" who swarmed into the

Mediterranean basin at the end of the twelfth century B.C. and threatened Egypt.[1]

In the classic world and in the Middle Ages the slave trade was the normal mechanism for supplying the labour market of the civilized world. It was obviously at the same time an instrument for imposing a continual process of redistribution of population. As slaves and soldiers the Cherkess were celebrated in the Byzantine and Islamic worlds, and they finally rose to fame in the celebrated Mamluk Corps which dominated Egypt until the time of Napoleon. The Mamluk Corps was in fact a sort of Foreign Legion which was recruited largely from the Western Caucasus and the Don steppe. It was the Mamluks who first defeated the Mongols at Ain Jalut (1259), one of the decisive battles of history. The Mamluks still maintained themselves in the Sudan after Mehemet Ali's massacre of the Cairo garrison, and one of the principal reasons for Mehemet Ali's conquest of the Sudan was his fear that the Mamluks might re-form and succeed in building a rival state on the Upper Nile. The last remnants of the Mamluks scattered to Darfur and beyond to Wadai, and I am told that their descendants are still to be met with occasionally in those parts.

The Ossetes (Russ. Ossetiny),[2] who occupied the Central Caucasus on both sides of the watershed, are an interesting people, anthropologically very mixed but speaking a language which is definitely Indo-European. Their language probably represents the survival of elements from the Germanic wanderings in the South Russian steppe during the first centuries A.D.

The Georgians are the most numerous and at the same time most civilized group in Transcaucasia. These peculiarly gifted people, who produced a brilliant mediaeval culture, have inherited an original literature and a rich art. Georgia is divided by the Suram range into Western Georgia, represented by the basin of the Rion and the surrounding mountain ranges, and Eastern Georgia covering the middle valley of the Kura and its affluents.

The Western Georgians speak the distinctive Mingrelian dialect of Georgian and they are generally described as the Svano-Colchian group. They include the Svans of the main chain, the Mingrelians and Imeretians of the Rion basin, and the Adjars and Lazes of the Pontic Alps.[3] The Svano-Colchians probably include elements of the original population of the Caucasian isthmus. There is a long-headed element along the Black Sea coast and negrito types have been observed.[4]

The Eastern Georgians (Kartlians and Meskhians) represent an early movement into the Kura valley from Asia Minor, which probably took place between the seventh and fifth centuries B.C. Place-names in Pontus and

[1] See Hall, "Caucasian relations of the peoples of the sea," in *Klio*, Band XXII, Heft 3, pp. 335–44; *cf.* also Eisler, "Seevölker Namen in altorientalischen Quellen," *Caucasia*, Fasc. V, pp. 73–130.

[2] The Ossetes call themselves Os, As, or Iron. The form Ossetes derives from the Georgian locational termination: Os-eti (=Os-land).

[3] For the Lazes, see my "March-lands of Georgia," in *Geogr. J.* 74 (1929) 135–156. For general ethnography of Georgia, see articles by A. Gugushvili and A. Javakhishvili, in *Georgica*, I, Nos. 2 and 3 (1936).

[4] *Cf.* Herodotus's story of "black Colchians" and the ancient confusion between Colchis and Ethiopia.

Cappadocia indicate that the Kartlo-Meskhian group at one period occupied a much wider area than they do to-day. I think it is generally recognized that the biblical Tubal and Meshech, and the classical Meskhoi and Tibarenoi, can be identified with the Meskhians and Iberians of mediaeval Georgia.

It is interesting that the Georgian language gives a key to the tribal names of some of the Asianic peoples. For instance, Mitanni is equivalent to "mountains" in Georgian [1]; Tubal may be rendered *Tbeli*, meaning "a lake-dweller," or "people of the lake country," with reference to the lake district of the Upper Kura.

Kurds.—There are probably also connections between the Kurds and the Georgians. The classical Karduhkoi (Kard-ukh-oi) of Xenophon represents simply the Georgian nominal root Kart, with Armenian and Greek plural suffixes. The Kurds are of course a very mixed people. The Kurmanji language is classified as Indo-European, but Professor Nikitin and others have shown that it contains many non-European elements. Nordic types are not uncommon among the Kurds. At the same time the short dark Zaza Kurds of the Dersim represent one of the most primitive stocks in Asia Minor.

The Armenians (who call themselves Hai-kh) represent later intrusions into Asia Minor which can be correlated with the movement of the Meskhians and Iberians into the Kura valley. The Armenian language, again, is classified as Indo-European, but Professor Nikolay Marr and other students of the language have shown the extent to which it is penetrated with pre-Indo-European elements.

Physically there are no very marked differences between the various peoples of Asia Minor and the Caucasian isthmus.[2] That peculiar type which is native to these parts, so-called autochthonous, is quite permanent, always resurgent, mastering the bodies of new masters. The strong-boned physique, the broad square head with its strong growth of wavy hair and beard, the wide dark eyes, the sallow skin, are bred to these mountain countries from the Ice Age. This type is called Armenoid, or more appropriately Alpine, and it has spread to Europe in prehistoric times along the mountain belt as far as the Pyrenees, and over Iran to the Pamirs; and it has filtered down through Palestine to Egypt, surviving, as all types, mostly in those parts which were likest in condition to its homeland. The peasantry of western Asia, whether they be called Georgian, Armenian, or Turkish, are of this autochthonous stock—out of the ground.

Languages are no criterion of race. The Anatolian peasant now speaks Turkish as he once spoke Greek and, before that, Armenian or some Asianic language, but he remains, like his neighbour across the Caucasian border, a peasant of the highlands who has watched armies and empires and systems come and go. The complexity and, in many ways, the unreality of racial differences illustrates how futile are political policies based on linguistic or somatic differentiations.

Caucasian racial elements in Middle East.—The Georgians and the Arme-

[1] *I.e.* mta ("mountain") and plural suffix ni. *Cf.* modern (Turkish) Dagistan = Mountain-land: The Highlands.

[2] See A. Javakhishvili, "The Caucasian race," in *Georgica*, I, 2–3.

nians and, for that matter, the tribes of Dagistan have, like the Cherkess, had a wide dispersion throughout the Middle East. The Later Roman Empire was strongly tinged with Armenian and, to a lesser extent, with Georgian influences. Several Armenian emperors ruled at Byzantium: the Isaurians and John Zimiskes. The armies of the Macedonian emperors, particularly, were largely recruited from the Armenian Themes.

Again, the various persecutions of non-conforming religious elements in Anatolia, like the Paulicians, led to the transportation of several hundred thousand Armenians to the Balkans. When the Mongols established their hegemony in Asia Minor and the Caucasus, the Georgians and Armenians played an important role both as intermediaries and as mercenaries. Large Georgian contingents fought under the Mongol banners at Bagdad, against the Assassins at Alamut, and the Mamluks at Ain Jalut; and it is an interesting fact that in the great battle between Erzincan and Erzurum, when the Muslims defeated the Sultans of Konya, a corps of three thousand Georgians fought in the Mongol ranks, while a Georgian prince commanded the Seljuk army. Again, in the seventeenth century, in Persia under the later easy-going Safavid Shahs, both Georgian and Dagistani nobles dominated politics at the court of Isfahan; and Georgian and Dagistani factions, supported by their ladies in the royal harems, carried on a continuous struggle for power. At one period there were Georgian garrisons at Kandahar and other Persian forts in Afghanistan.

In the following century a Georgian contingent under King Taymuraz participated in the Indian campaign of Nadir Shah. Many Georgian soldiers settled in Persia, and I am told that Georgian-speaking villages are to be met with here and there. From the eighteenth century Georgians and, to a lesser extent, Armenians began to play a similar role at the Russian court. One of the first and the best of Russian viceroys in the Caucasus was a Georgian prince, Tsitsianov (Georgian, Tsitsishvili), and the celebrated Bagration, who held a command in the field against Napoleon, was a member of the royal house of Imereti.

Georgians and Armenians have continued to play a prominent part in modern Russian politics, both in the pre-revolutionary Menshevik party and in the Bolshevik party. Georgians and Armenians have, in fact, played in the Middle East and in Russia somewhat the same part as the Irish and Scotch have in the Anglo-Saxon world, and which, to a lesser extent, they played throughout Europe in the eighteenth century.

The same phenomenon may be noted among the Albanians who have penetrated everywhere in the military and political fields in Turkey and Egypt and among the Basques who have achieved rather similar prominence in Spain and South America. Each of these small peoples, never able for long to preserve national independence or to build viable states, send out, generation after generation, wave upon wave of adventurers who treat the whole world as their stage. Certain types of terrain undoubtedly breed men of a high average of vitality, who come into continuous conflict with each other if confined within the narrow limits of their native lands, but who can direct their vital urge into creative channels when set loose among populations of a lower average of vitality.

Turks of Azerbaijan.—Appropriately, as the arid valleys and plateaux of Eastern Transcaucasia form naturally a westerly extension of the Aralo-Caspian depression, they are inhabited by a Turkish or Tartar population (the two forms of the same name are really interchangeable) closely akin in speech and way of life to the Turko-Tartars of Central Asia. The Turks of Azerbaijan belong essentially to the eastern rather than to the western group of Turks. The language of Azerbaijan is akin to the harder Jagatay Turkish of Central Asia and contains many Persian words and idioms. The Azeri Turks adhere to the Shi'a heresy of Persia, and Azerbaijan was in fact the homeland of the Shi'a creed and of the great Shi'a family of Safawi Shahs.[1]

The original population of Eastern Transcaucasia, called Albanians or Aghovanians in classical sources, were probably akin to the East Georgians (Iberians). Until the seventh century A.D. there was an Albanian language into which the Bible was translated. Culturally, Eastern Transcaucasia has been very much under Iranian influences since the remote period when the Persian Sassanids were holding Derbent against the northern nomads. Turkish elements were already established there soon after, if not before, the era of the Hejira. One of the Arab geographers about the ninth century A.D. describes the typically Turkish physical type and compares the dialect of Azerbaijan with that of Khorasan. The name Azerbaijan was only applied to Eastern Transcaucasia after the Russian revolution. The original names were Shirvan for the country north of the Kura, Aran for the country between the Kura and the Araks, and Mughan for the steppe south of the Araks junction with the Kura. The adoption of the name was calculated to emphasize community of interest with the Turks of Persian Azerbaijan.

It is worth noting that while the Volga and Crimea Tartars have passed increasingly under the influences of their Russian neighbours and the Anatolian Turks feel the attraction of the Mediterranean world, the cultural background of the Caucasian Turks, like that of the Central Asian Turks, is very largely Iranian. The Turanian and Iranian worlds have for two thousand years, probably for very much longer, been subject to mutual mixing and to all kinds of linguistic and cultural cross-currents.

In Eastern Transcaucasia and in Dagistan the Arabs must not be ignored as a creative factor which has influenced the cultural mould of modern populations. The Arab Caliphate, which in form was half Iranian, ruled the Eastern Caucasus for about the length of time the Romans ruled in Britain. Arabic has remained the classical language of Eastern Transcaucasia as Latin persisted in Western Europe and Greek in Orthodox Russia. In the mountain *auls* of Dagistan are to be found many learned Arabists, Hajis who have made the journey to Mecca; and Arabic rather than Turkish remains the basis of orthodox Islam in the Eastern Caucasus. Turkish, the language of the common man, is the vehicle rather of modern nationalist trends, and Russian of Communist thought and influence.

[1] Nizami, one of the greatest of Persian poets, was a native of Ganca and a contemporary of the celebrated Georgian poets, Shota Rustaveli and Sargis Tmogveli, who were both under the influence of the Persian literary tradition. Modern Azerbaijan has produced excellent poets and actors who maintain the tradition of the Persian theatre; modern Georgian (Soviet) art retains strong Persian influences.

The grassy steppes and highland pastures of Eastern Transcaucasia proved an irresistible attraction to the nomad armies of central Asia. The Mughan steppe in the southerly bend of the Araks was famous as horse-raising country from classical times, when Strabo recalled the "Nisæan steeds" of the Achæmenian kings. It is interesting to think that these famed Nisæan horses, bred on the rich pastures at the nearest point of junction between the Eurasian and the Eurafrican worlds, probably represented a perfect cross between the two great northern and southern breeds of horses.[1]

In the Middle Ages the country to the south of the estuary of the Kura became the main base and principal remount depot of successive nomad armies: Seljuk Turks and Mongols. After the conquest of Iran the Mongols moved north to the Mughan and from here began their invasion of Russia, following the foreshore of the Caspian, and swinging westward across the Lower Don. Later in the same century the Mughan became the standing winter camp of the Mongol Ilkhans of Persia, and in the summer their great herds of horses moved up to the pastures of Karabagh and Zangezur. From the Mughan the Ilkhans dominated Iran and 'Iraq to the south and east, and Anatolia as far as Syria to the west; and they were in a position to move northward at short notice against their kinsmen and rivals of the Golden Horde, established on the Volga.

A century later Tamerlane revived the power of the Southern Mongols, and in his campaigns against Toktamish secured a decision in the long feud between the Iranian and Volga Mongols. Tamerlane, the finest nomad of them all, was only happy in his great camp which moved according to the season between the Mughan steppes and the highlands of Karabagh to the upland meadows of Göle in the region of the sources of the Kura, and Bingöl ("thousand lakes") to the south-east of Erzurum. From their grazing bases in Eastern Caucasia, his armies ranged over all the old world between the Volga and the Mediterranean, and from here Tamerlane set out on his last great ride towards China.[2]

The Mongol strategy, based on the maximum mobility of horsed armies and on the maintenance of great reserves of horseflesh, was influenced by location of pastures. In the same way, those who direct the strategy of modern mechanical armies must be influenced by the location of oil reserves—the grazing of Armoured Fighting Vehicles. It is curious that the pastoral wealth of Eastern Caucasia, a significant factor in the planning of Mongol campaigns in the Middle East, was located in the same area as the vast petroleum reserves of modern Baku and the Ural–Caspian basin.

[1] For the crossing of the Central Asian and African ("Arab") breeds, see Ridgway, 'Origin of the thoroughbred horse.'

[2] *Cf.* M. V. Minorsky, *J. Asiatique*, vol. 217, 1930; *Transcaucasica*, "Min-Göl et les Expéditions de Timur." The highly-trained and seasoned Mongol cavalry, followed by herds of remounts, changed horses several times a day and were capable of covering 100 miles in twenty-four hours, a rate of advance which compares favourably with that of modern armoured fighting vehicles. Baddeley, 'Rugged flanks of Caucasus,' I, p. 121, recalls that General Veliaminov records that Chechen horses, specially trained, could carry their masters 100 miles between dawn and dusk on a summer's day.

In Caucasia, just as there is an extraordinary juxtaposition of race and creeds, so there are extraordinary social and economic contrasts. The impact of the industrial revolution on the Middle East has produced the phenomenon, amongst others, of the great oil industries of Caucasia and Persia, located among populations who are either tribal and pastoralist or engaged in agriculture and small village industries. Baku, with its mixed population of all the nationalities of the Soviet Union, is the third industrial centre of Russia. On its oil production, combined with that of the lesser fields of Maykop and Grozny, to the north of the main chain, and the new Emba–Ural fields to the north of the Caspian, depends the transport, the industry and the mechanical agriculture of Soviet Russia.

To the north of Baku is Dagistan, comparable in social and economic conditions with the North-West Frontier of India. To the south are the Araks steppes, now partly being put under cotton, and the primitive communities of the Lenkoran forest zone. Across the Caspian stretch the wide deserts of the Aralo–Caspian depression.

The mountainous areas of Caucasia, the upland glens and valleys of the main chain and the meadowlands and high plateaux of the Armenian peripheral rim, are sparsely inhabited except on the Erevan plateau where the concentration of an Armenian population has led to a rather artificial industrial development. Population clusters thickest in the middle valley of the Kura and in the western valley of the Rion and along the fertile but insalubrious Black Sea coast. After Baku, Tbilisi and Erevan are the most important centres of population.

Communications

In Caucasia communications follow the seashore, and the principal river valleys. The railway from Rostov to Baku runs along the foreshore of the Caspian. Another railway (so far incomplete) and a motor-road follow the Black Sea coast. Baku and Batumi are linked by the Transcaucasian Railway, which is built along the line of the Kura–Rion valleys, crossing the ridge of Suram by a tunnel. Another line, completed in recent years, links Baku with Erevan via the Araks valley and the line of the Russo–Persian frontier. There are various transverse branches which link the Transcaucasian and Araks lines.

A motor-road, but no railway, crosses the main chain of the Caucasus from Ordjonikidze to Tbilisi. It is worth emphasizing that a large proportion of Transcaucasian traffic is transmarine. It is estimated that 40 per cent. of Soviet internal trade passes across the Black Sea and the Caspian Sea and over the internal waterways of Russia. In normal times the production of Transcaucasia is moved by sea from Batumi and Poti to Russian Black Sea ports. The bulk of Baku production is transported by water across the Caspian and up the Volga. The two marine basins, the Black Sea and the Caspian, have the same importance in the economy of the U.S.S.R. as the Great Lakes have in Canadian and American economy.

The impact during the last century of modern industrialism on Caucasia, expressed politically in varied forms of imperialism and communism, has

produced conflicts which were inevitable. Nationality itself is a mass-consciousness of group characteristics which have developed in past epochs as a result of varying degrees of differentiation, imposed by the economic conditions of the time. An acceleration in human contacts, a general shaking up of semi-isolated communities, is an inevitable result of a revolution in methods of production and transport. The more fixed the state and psychology of a community, the more violent is the impact of new conditions.

Throughout Europe and the Middle East peasant communities, expressing themselves in terms of nationality, have attempted to resist the impact of industrialism and to apply the results of industrialism in their own defence. In the Middle East it was natural that the pastoral communities should react violently against the impact of neighbouring, and often alien, industrialisms. Instances of this reaction have been the great Basmaji movement in Turkistan, the Kurdish revolts in Asia Minor, and the Bakhtiari resistance to the local "modernism" in Persia.

The national Republics established in the Caucasus after the last war did not survive long, but the peasant resistance to Soviet innovations persisted into the 'thirties. Lenin, as early as 1918, saw the necessity for a synthesis between Russian Communism and the local nationalisms of the minority nationalities of the U.S.S.R. The Soviets have since developed a nationalities policy which recognizes the individuality of the different national groups within the Union. Thus Transcaucasia consists of the three Soviet Republics of Georgia, Armenia, and Azerbaijan, each of which is a full member of the U.S.S.R. Numerous smaller groups enjoy the status of autonomous S.S.R. or Districts within the Union. This system holds promise of allowing the minority nationalities some prospect of self-expression within the structure of the Soviet Union.

DISCUSSION

Before the paper the PRESIDENT (the Rt. Hon. Sir GEORGE CLERK) said: Captain W. E. D. Allen is well known to us as an authority upon the history and the peoples of the Caucasus. He is the author of a 'History of Georgia,' and has contributed several papers to the *Journal*. A year or two ago he wrote a 'History of the Ukraine' which received high commendation.

Captain Allen then delivered the lecture printed above.

The PRESIDENT: We have listened to an absorbing lecture on one of the most interesting portions of the globe, one of the oldest and one which, as our lecturer has shown, exercises very great influence on the development of a large portion of humanity.

As one of the early photographs indicated, it is a wonderful country, especially when viewed from Trebizond as I have viewed it. There, in the middle of the foreshore, is the one and only place where the caravans must have arrived since time immemorial, and that custom has not changed. Going up towards Erzurum by the new road the Turks have made one sees the old road still going up the valley, and there is one point at which one can turn and imagine the spot where Xenophon and his ten thousand men must have fought. So the country goes on, unchanged, sending its influence out and exercising it in these days, as our lecturer has indicated. We share his hope that from this war and the policy which the Soviet Union is following there will emerge something that will offset the suffering that the Caucasians and the Russians are passing through now.

THE BURMA ROAD

SIR HENRY CRAW

Meeting of the Society, 18 May 1942

IT was only after considerable hesitation that I agreed to prepare a paper on the Burma Road. I have not been over its whole length, though I know the Burma end well and have seen its working both at Kunming and at Chungking (Pahsien). I do not propose to say much about it as an engineering feat, but rather to examine its efficacy as a supply route. There have been many criticisms of the organization of the supply system on the road, some justified and some unjustified, and I hope to explain some of the difficulties which were met and how far they were solved during the three and a half years since the first convoy left Burma.

In the summer of 1937 Japan began her attack on China. Her object probably was to separate the northern provinces from the southern and to organize in the north a Government entirely subservient to herself, such as had been set up in Manchukuo, but in this her plans miscarried. Chiang Kai Shek and his supporters realized that submission would only be another step towards the complete domination of the East by Japan, and determined on resistance. Japan's military and naval preparations over a long period of years enabled her to seize the whole coast line and to drive the Chinese armies back into the interior, but this military superiority could not break the spirit of the Chinese patriots, and after five years of fighting the Japanese are supreme only where they have a sufficiency of troops to beat down the resistance of the local inhabitants.

The Chinese leaders of to-day take the long view. In the first year of the war they realized that their long coast line could not be defended against attack by the powerful Japanese navy and that an alternative route must be found over which the supplies they needed from the West could be brought in. The railway through French Indo-China gave them one line, but its capacity was too limited and its exit to the sea was too exposed to Japanese interference to make it either adequate or reliable. A safer line was necessary, and in the first place the Generalissimo turned his attention to Rangoon. About forty years ago the British Government had been interested in the continuation of the Burma Railway eastwards to Yünnanfu, now known as Kunming, and a detailed survey of the alignment had been made by Colonel Davies. At that time the Chinese Government was not enthusiastic over the project and British interests were also not too sure of its commercial possibilities; the scheme was abandoned. The survey however showed that such a line, though difficult, was possible, and the Chinese Government now began to plan its construction. A railway over steep mountainous country like Yunnan, with the formidable gorges of the Mekong and the Salween to cross, could never be ready in time to help China in her hours of greatest need. A road however was a different proposition. China's man power was enormous, and the Generalissimo could rely on it to carry out the formidable task of building those 600 miles of motor road. Mechanical aids to excavation and

construction were almost entirely lacking; nevertheless in little over a year, *i.e.* by the end of 1938, a road was made which has carried large quantities of valuable materials to China and has enabled her to carry on the unequal struggle with her powerful assailant. The Chinese by the end of 1938 had brought the road to the boundary at Wanting, and by that time the Government of the Federated Shan States had completed the link between Lashio and the boundary. The traffic began in January 1939 and it has continued and increased ever since, at least until the occupation of Burma by Japan cut off supplies at the source. As was to be expected the road on both sides of the frontier, as it was on 1 January 1939, left much to be desired; the alignment on the whole was good, though in some places minor changes have had to be made; but the surface was rough in the extreme. During the first season, on both sides of the boundary, it consisted of blocks of stone, hand-laid and covered with layers of sand and gravel. Points of stone soon protruded through the gravel layer and in many places the road looked like a well-filled pincushion with the pin heads 2 or 3 inches in diameter. It made a bumpy ride for the passenger and it was very hard on the vehicles, but traffic went on.

During the first rains the difficulties increased. The rains begin in May and go on till November with an average annual fall of from 75 to 90 inches; and with frequent downpours. Landslides and culvert washouts were common; deep potholes pitted the surface and a sea of mud in places hid them from the driver till his wheels went in. Difficulties were enormous, but still the lorries ploughed their way through. Gradually however conditions improved; in the dry weather of 1939–40 the Burma section was metalled and tarred and preparations for a similar improvement on the Chinese side were being made in 1941 when the Japanese war in the Pacific intervened.

All this time however the Chinese Government had by no means abandoned its plans for a railway construction. As much as could be spared of the old F.I.C. (French Indo-China) line was dismantled and used for the construction of lines leading both east and west out of Kunming; the bed of the new line towards Burma was cut and prepared, and throughout a great part of its length only awaited the supply of rails and other materials through Burma. The British Government was prevailed on in 1941 to agree to undertake the construction of the 100 miles to join up railhead to the boundary, and the work on this section was in progress when the Japanese attack came. It has of course been stopped, but when China regains control there can be no doubt that this railway line will be made and that China will insure herself thereby against future aggressions. On this point of future security she seems to be as determined as she has shown herself to be in her past resistance.

Not content even with this outlet to the sea through Burma, China looks further to the establishment of direct access to India by land. Such a road would present even more serious a problem than did the Burma Road. It would either have to cross the Tibetan plateau or cut across the mountain ranges of northern Burma. If the Burma line is chosen, passes of 11,000 or 12,000 feet must be negotiated, but the worst difficulties would probably be met within China's own territory where the three great rivers, the Yangtze, the Mekong, and the Salween, with their high intervening ridges, all have to be crossed within a distance of 150 miles. It seems an almost impossible

engineering task, but the Chinese are apparently unwilling to class anything as impossible if it is necessary for their future security, and we may yet see that road put through as the Burma Road has been.

These ambitious plans for the improvement of traffic facilities with the West are however for the future, and will depend on the outcome of the war in the Pacific; the Burma Road has on the other hand been a concrete fact for the last three and a half years and has well justified its construction. In the *Journal* for March 1940 Mr. FitzGerald gave a vivid description of the country through which the new road passed as far as Paoshan, at which point he left it to proceed *via* the old mule track to Tengyueh (Tengchung). The profile view of the road as far east as Tali gives an idea of the difficulties which had to be overcome. The heights and distances were worked out roughly by Mr. Nicholson, the engineer responsible for the Burma section of the road. Mr. FitzGerald pointed out that the new railway alignment leaves the road between Yünnanyi and Siangyün and follows an easier route, avoiding the crossing of three intermediate ranges. The railway alignment goes down the Red river, crosses the watershed between that river and the Mekong and then makes the greatest possible use of the valleys of tributaries of the Mekong and the Salween to ease the ascents and descents.

It seems curious that the Chinese engineers, who were anxious for as rapid construction as possible, did not select the easiest line for their road, but probably the reasons were that the alignment they chose runs through the most fertile and populous parts of western Yunnan where labour was easier to obtain than in the barren valleys to the south, and that the Yunnan Government may have had some say in the selection and may have been influenced by the wishes of the inhabitants of Paoshan, the largest town of western Yunnan. The traders of Tengyueh still farther west also made strenuous efforts to get the road brought through their town, but this the Chinese Government resisted; the difficulties of the crossing of the Salween gorge at this point and the fact that a line through Tengyueh would lead the road into Bhamo, which is not in the Burma railway system, were probably responsible for this decision, and the Chinese Government may have thought they had yielded enough to Yunnan in selecting the alignment through Paoshan. Nevertheless even up till the middle of 1941 the Tengyueh merchants were pressing for the construction and nearly persuaded the Central Government to undertake it as an alternative route.

When the Chinese Government had made its decision on the route to be followed the Government of Burma had two alternatives, either to construct a road north from railhead at Lashio or a road from Bhamo along the boundary. The Chinese wanted both roads so as to enable them to use both rail and river, but if only one was to be built they considered the Lashio connection most urgent. It will be remembered that when the plans were under consideration the F.I.C. railway was still open and there was no immediate prospect of its being closed. The Burma Road was intended to deal with the surplus which the railway could not handle, and as there seemed no probability that the traffic would be more than one road could cope with the Burma authorities concentrated in the first place on the provision of a good road to the frontier from Lashio. There was in 1938 25 miles of lightly

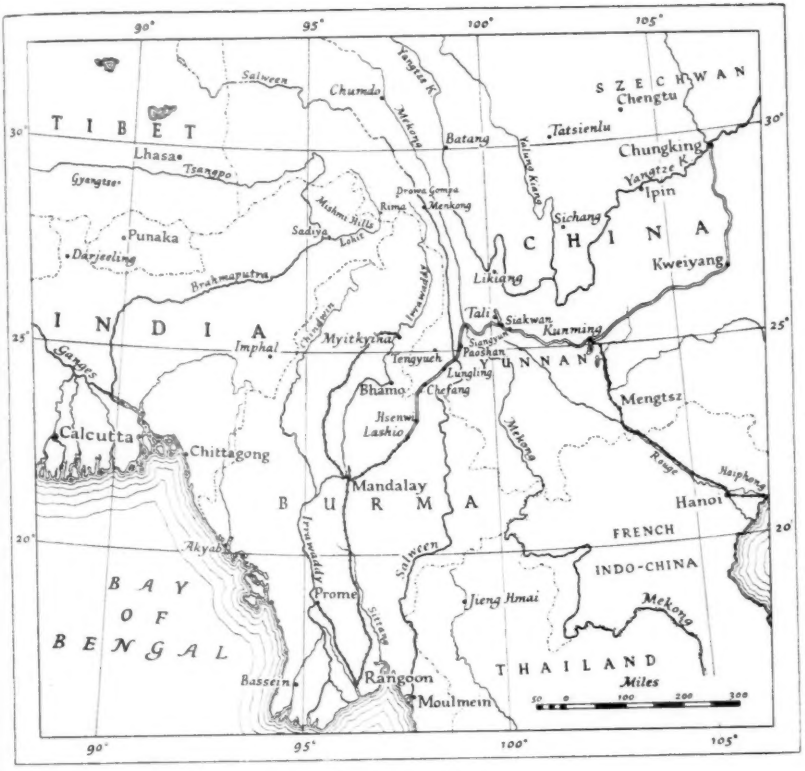
metalled road to Hsenwi, but from there onwards there was only a gravelled surface open for light motor traffic in the dry weather, and it took two open seasons—1938–39 and 1939–40—to bring this road up to a good all-weather standard. Later however when French Indo-China closed the railway and it became clear that the Burma railway and the single road were inadequate, the Burma authorities took up the construction of the Bhamo link, which was scheduled to be completely metalled by the end of 1941.

1937 and 1938 were occupied with the problem of alignment and construction, but the solution of these problems did not end the Chinese difficulties. The road was a means to an end, and that end was the provision of China's much-needed supplies. Until the latter half of 1940 the railway from Haiphong was carrying goods to China; its capacity was said to be about 20,000 tons per month and, though it is doubtful whether this total was frequently reached, its existence for the first eighteen months after the road was opened gave the Chinese Government a chance to organize its road transport for the heavier task which lay ahead, when the whole burden fell on the road. The work of organization was entrusted to a semi-Government company called the South-west Transportation Company, functioning under the direct control of the Ministry of War. This company too was in charge of transport operations at Haiphong and, though there had been serious complaints about its working there, it was the natural course to extend its control to the new overflow road. It opened an office in Rangoon with branches at Lashio and Kunming as well as at intermediate stations on the road. It entered into a contract for one hundred and eighty lorries to operate to a point just across the frontier at Chefang, and set about importing a fleet of its own. There was already a large number of lorries in China, and it was intended that the transportation of goods from Chefang onwards should be handled by these. As soon as the road was opened private traders also came in; prices of commodities in Kunming and Chungking were very high and the prospect of an extremely lucrative trade soon attracted between nine hundred and one thousand privately owned lorries. Some belonged to big business concerns like Steel Bros., who carried their own goods into China, but many were of the common carrier type owned by small contractors and dependent on freight rates. Transport worked more or less smoothly till the middle of 1940. During the first rains an average of about seventy lorries a day crossed the boundary carrying about $2\frac{1}{2}$ tons each, and this figure increased during the dry weather of 1939–40 to about two hundred and fifty lorries per day. This meant that at its maximum volume about 19,000 tons of goods a month were going into China. Of course this included a considerable volume of private trade goods, but the Chinese Government's share of the traffic was large, and up to this point there was no unwieldy accumulation of stocks in Rangoon or Lashio. It is true that the S.W.T. books showed big stocks on hand, but much of this consisted of heavy machinery, rails, and other articles which it was never intended to send up. A great deal of useless junk was sent over from Hongkong which only clogged up the clearing yards.

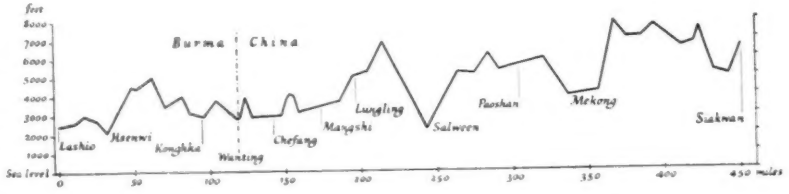
Towards the end of 1940 however the situation deteriorated. There were three main reasons: the rough surface of the road and the steep gradients had put many of the lorries originally employed out of action and replacement was

not rapid enough; profits of private trade were so large that traders, mostly Chinese, pushed up the freight rates to such a height that the Chinese Government was squeezed out; the S.W.T. Company charged other departments of the Chinese Government such high rates and were so slow in meeting their requests for transport that they had to go into the already over-crowded open market and compete with one another for the available lorries. The result was that freight rates reached the impossible figure of 1200 rupees per ton, which meant that a lorry owner very nearly got back the cost of his lorry in two trips. Towards the end of 1940 the Chinese Government found itself in a dilemma; it had to get all its requirements through Burma, as French Indo-China was then closed; it had not enough lorries of its own to meet the new demand, and private lorries could only be got at extortionate rates. It appealed for aid to the British Government and issued orders that the road was closed to private merchandise. The Burmese Government was interested in the prevention of heavy accumulations of goods either at the docks or in the depots, and after consultation with representatives of the Chinese Government issued a regulation establishing a road control and giving to the controller power to fix freight rates and to require users of the road to set aside a percentage of their fleet for the transport of Chinese Government goods across the boundary. This eased the situation considerably, and until the arrival of American lease-lend cargoes in June 1941 there was no further serious trouble in Burma.

In the meantime however the transport situation within China was becoming serious. In spite of the very large number of lorries which was being imported into China the goods crossing the boundary were not going through. It was estimated that only 25 per cent. was reaching Kunming, the rest being dumped in depots alongside the road. America was interested as these goods were being paid for out of credits she was giving China and her interest was going to increase when lease-lend came into force. To clarify the position three American transport experts were sent over headed by Mr. Daniel Arnstein to examine the situation and make suggestions. Mr. Arnstein's report set out that the surface was bad; that half the Government fleet were out of action through lack of care in maintenance and shortage of spare parts; that unnecessary delays were common, and that there were no statistical records kept which would enable a supervisory officer to see what was being done. He recommended the employment of American road engineers, motor mechanics, and traffic controllers to train the Chinese, and promised the immediate supply of vehicles and spare parts and other necessary stores if his recommendations were accepted. The report was a scathing exposure of the weakness of the road administration, and probably all comments were true, but possibly it was hardly fair to the Chinese in that it did not take into account lack of experience of this kind of work and the financial difficulties under which they were labouring during the brief period of the working of the road. One of their greatest shortages had been in good mechanics and drivers; the country through which the road ran had never seen a lorry till the road was built, and local recruitment was not possible. Trained men had to be brought in from the coastal towns and were apparently not easy to get. There were certainly excuses which the Chinese Government could plead for



The Burma Road



Profile of the Burma Road between Lashio and Siakwan

Japanese bombing of Chungking, the terminus of the Burma Road

the shortcomings pointed out by Mr. Arnstein and his colleagues. Whether Mr. Arnstein was too severe or not his report had its effect. The Chinese Government apparently accepted his recommendations and appointed an officer with the rank of general, aided by an American adviser, to put them into effect. This was being undertaken when the Japanese attack on Burma came.

A survey of the working of transport on the Burma Road would be incomplete without some reference to the petrol situation. China produces practically no mineral oils, and when I was in Chungking last year I saw many vehicles running on vegetable oils, mainly obtained from rape seed. The price of petrol was enormous and it could only be got on a Government permit. At the opening of the road every lorry, or every convoy of lorries, had to take with it enough petrol to carry it to its destination and back. The poor surface and the steep ascents increased consumption and the normal calculation was that a 3-ton lorry starting out on the 700-mile trip from Lashio to Kunming had to carry 200 gallons of petrol on the basis of 7 miles to the gallon. This meant that of the 3-ton load one quarter had to be allocated at the outset for journey petrol. Later the Asiatic Petroleum Co. and some of the American oil companies set up petrol depots at the frontier and at several points on the road, but even as late as the end of last year most of the road users carried their own requirements. There were rumours of a plan to construct a pipe-line from Bhamo, and it seems possible that something of this kind may be done in the future; certainly if there is going to be any considerable volume of motor traffic on the road when peace is restored some less expensive method of providing petrol will be required. It should be noted that in addition to petrol for the conveyance itself large quantities of petrol for general use in the interior had to be transported. In a normal month petrol cargoes amounted to about half of the total tonnage entering China and sometimes the figure rose as high as two-thirds.

Another factor which affected the working of the Burma Road was enemy interference. After the Japanese occupation of French Indo-China the whole length of the road from Kunming to the Burma frontier was within range of their bombers; nevertheless on the whole the amount of damage done was less than might have been expected and certainly far less than was claimed by the Japanese. The most vulnerable points were the suspension bridges over the Salween and the Mekong, but as targets they were not very easy. There was no air defence near these bridges and the ground defences were not very strong, but the bridges were never out of use for very long, and when they were temporarily closed the Chinese set up rafts on which the waggons were ferried across. The area round Kunming was another favourite point of attack, and as that town is the distribution centre for all goods going into China considerable confusion resulted from the earlier attacks. Kunming is not like Chungking, a town which lends itself to A.R.P. It lies in a flat valley alongside a large lake and underground shelters are said to be impossible. Raiding in the open season took place three or four times a week and the only escape was to slip out into the low hills round the valley. This is what both the townspeople and the lorry drivers used to do, and as air-raid warnings were usually given in good time casualties among men and vehicles were

fewer than might have been expected. Other raids took place on towns where it was known that dumps had been set up, *e.g.* Paoshan and Chefang, but though the damage in some cases was considerable raids were few and could not be said to interfere seriously with the traffic. On the whole air raids were a nuisance and slowed up traffic to a certain extent, but the actual damage was far less than has been claimed.

Among other criticisms in Mr. Arnstein's report particular stress was laid on the numerous checks in the flow of traffic on account of tolls and other revenue demands. These exactions did not affect Chinese Government owned goods, but traffic blocks round toll stations at the frontier and in towns often caused serious delays. The Province of Yunnan possibly owing to its distance from the seat of the central Government had retained a good deal of independence both in financial matters and in other respects, and this independence it is still unwilling to surrender. It still keeps its right to impose taxes on goods coming in or passing through. It relinquished its claim to collect customs duties on the central Government goods entering from Burma but insisted on collecting on all others. A lorry registered for use in China would pay the central Government Customs Tax and would also be liable for the Yunnan Consumption Tax, which was nearly twice as much as the central duty. The cargo carried by such a lorry was liable in the same way to both taxes, which were collected by different agencies at different stations. Again the Highway Administration charged a wheel tax at a fixed rate per ton-mile while the Yunnan Government charged a similar road tax although the maintenance of the road was a burden on the central Government (these two taxes amounted to 230 rupees per trip from the border to Kunming and back). In addition there were smaller demands at Kunming and other places. An attempt was being made by the central Government to consolidate all these demands into a single payment, but the Yunnan Government was difficult to persuade and nothing had been arranged when I left Burma at the end of last year. The central Government taxes were fixed and presented no difficulties, but the Yunnan Government taxes were liable to frequent variation and will cause considerable interference with commercial traffic after the war unless the Chinese Government proposals for consolidation can be put through.

There is another question which has got rather closely mixed up with the Burma Road and which has met criticism especially in America. Under the Burma Constitution set out in the Government of Burma Act of 1935, while defence and foreign affairs remain under the control of the Governor, the internal administration was placed under a ministerial Government and taxation in general and the imposition of customs duties in particular come within their scope. Transit trade was non-existent before the China traffic began and the only legal provision which could lighten the customs burden for the Chinese was the clause in the Tariff Act which permitted of a refund of seven-eighths of the duty if goods were re-exported. This was recognized to be too high a charge and very early steps were taken to reduce it to a 1 per cent. *ad valorem* charge on all goods consigned to China. The Government of Burma had very considerable charges to bear in connection with this trade, the main items being the making of roads and their maintenance, the provision of armed guards over goods from the day of arrival in port till they

crossed the frontier, and the provision of additional customs posts and staff. So long as imports were on a comparatively small scale the Government's receipts just about covered its expenditure. This was in consonance with the terms of the Barcelona Convention which lays down that duties on transit trade should cover costs and no more. When however the trade increased after the closing of the F.I.C. railway, and still more so when lease-lend shipments began, the receipts did constitute a profit and that profit was likely to increase. The Burmese ministers were however in a difficult position. The opposition and the press clamoured for retention or even increase of the duties. The Burmese were, I think, really pro-China in their sympathies, but the opposition was unscrupulous and was willing to use any weapon to attack the Government. A general election was imminent and the Ministry was afraid to risk its political safety by sponsoring a reduction of duty. It argued that as neither China nor the U.S.A. had signed the Barcelona Convention Burma was not bound to observe it in this case, and it refused reduction. The decision was one which might cause friction with China and the U.S.A., and the British Government undertook to meet the cost of the tax. The charges against the British Government were unwarranted as in the first place the tax was not discriminatory but was imposed on all goods, secondly the Chinese did not pay it on lease-lend goods, and thirdly the British Government was in no way responsible for the levy, but on the contrary took the earliest possible steps to relieve the Chinese Government.

There is yet another question in connection with the Burma Road which seems to have given rise to a considerable amount of misconception, and that is the so-called closing of the Burma Road in 1940. The general view seems to be that the British Government stopped all traffic on the Burma Road for three months. This is very far from the truth, and in fact during these three months a larger volume of traffic went over the road than in any previous months of the rains. In September the daily average was two hundred and twenty-five lorries. The closure was limited to munitions, aeroplane parts, and petrol, but except for petrol very little of the barred commodities was awaiting transport up the road. As regards petrol, lorries going in were given enough to take them to their destination and back so that regular transport could go on, but no cargoes of petrol for other use were permitted; this was probably the worst feature of the agreement from the Chinese point of view. The practical effect of the measure should not be exaggerated; it was probably more psychologic than material.

Before closing this paper I may refer to a question which was raised at the end of Mr. FitzGerald's previous lecture, namely the future prospects of this road from a commercial point of view. Since that paper the railway scheme has been approved, and if after the war the Chinese Government carries out its declared intention to complete this line there will be a double avenue to carry what in the past has been only a small volume of trade. When I was in Chungking I discussed this question at length with both official and non-official Chinese; their arguments are that Yunnan has great mineral wealth, coal, wolfram, tin, gold being the main possibilities. They say that silk culture can be taken up west of Kunming and that there is good tea country alongside the line after it turns south at Siangyün. They foresee a large

increase in the population throughout the newly opened country and they point out that the roads from the north, in particular the one which has been constructed from Szechwan to Siangyün will bring in additional traffic. Against these arguments there are the undisputed facts that the F.I.C. line will give a shorter and probably cheaper route to the sea for all goods coming through Kunming from the north and from a large area west of that town; that coal freights from the mines near Kunming would have to be extremely low if it is to compete with Bengal coal brought into Burma by sea; that no geological survey of Yunnan has yet been made and that it is not possible to say whether mineral deposits are commercial propositions or not; and that the agricultural possibilities will take long to develop and may or may not be all that their advocates promise. All that one can say on the subject is that at present the Chinese Government hold the view that communications with Burma are a national necessity and that they are prepared to maintain them whether they pay or not. They are hopeful that development of the population and of its wealth will make the line a paying one but will not be disheartened if their hopes are not fulfilled. From my experience of the Chinese I should think it probable that they will be as good as their word as regards maintenance of the line, and if this is so the railway will at least be given every chance to prove or disprove the forecasts of its promoters.

DISCUSSION

Before the paper the PRESIDENT (Sir GEORGE CLERK) said: Two years ago we had an account of the Burma Road from Mr. Patrick FitzGerald, who described the details of the route and the difficulties of construction. This afternoon we welcome Sir Henry Craw, who has recently returned from a period of service as Chief Secretary to the Government of Burma and is now Adviser to the Secretary of State for Burma. Sir Henry will, I think, concentrate particularly upon the use which has been made of the Road, a subject which was uppermost in the minds of those who took part in the discussion after the earlier paper, and the organization of transport.

Sir Henry Craw then read the paper printed above.

The PRESIDENT: We have had a most interesting paper read to us, and I am sure we all share Sir Henry Craw's hope that when the war is over the Burma Road will become a definite and permanent link between China, Burma, and India. Meanwhile the war has to be fought to a victorious end, and when that happy day comes I take it that the road will be put in order and even extended. That will be a great work. In conveying your thanks to Sir Henry I should like to pay a small tribute to what I realize must have called for amazing courage because, from his description, a journey over the Burma Road by lorry must be a most frightening experience. He did not say how long that journey took, but I take it there was not much in the way of hotels?

Sir HENRY CRAW: It takes five days to do the journey. On the way one finds very indifferent inns and not very good beds.

The PRESIDENT: And an even chance of being sent over the side of a precipice.

Sir HENRY CRAW: That I think is frequent.

The PRESIDENT: Sir Henry Craw has given us a delightful paper for which we all express our best thanks.

THE HARAMOSH PASS

CAPTAIN EADRIC CLIFFORD FOUNTAINE, R.A.M.C.

Note.—Dr. Fountaine accompanied Mr. Eric Shipton's expedition to the Karakoram in 1939 as medical officer. An account of this expedition was published in the *Journal* for June 1940, in the last paragraphs of which there is a brief mention of the journey by Dr. Fountaine from Arandu over the Haramosh pass to Gilgit, which is related in greater detail below. The outbreak of war made it necessary to abandon plans for further work in 1940, and the party broke up. Dr. Fountaine returned to England to serve in the R.A.M.C. in places where his previous expedition experience must have been of special value. While still an undergraduate he had climbed in the Lofoten Islands; in 1935 he accompanied Courtauld's and Wager's expedition to East Greenland; and was a member of the party that ascended to the highest point of the Watkins Mountains. He was known to his companions as a first-rate traveller, with a useful knowledge of survey, and as a valuable medical officer. He was killed in a motor accident on 3 January 1942, while on active service in Iceland. He had been a Fellow of the Society since 1938.

The sketch-map has been taken from the Karakoram 1/750,000 map, and is only approximate in the region of the Haramosh pass.

LHAKPA TENSING and I arrived at the camp on the Snow lake at about eleven o'clock on the morning of 11 September 1939. It was snowing and the camp was completely deserted. A note from Russell explained that Mott was working on the Hoh Lungma glacier, Fazal Ellahi was finishing his survey of the Biafo glacier, and Russell himself had gone down to Makorum to get fresh stores and to try to get some news on the radio.

It was not until I read Secord's telegram from Srinagar, which had reached the expedition by runner from Skardu, that I understood Russell's sudden desire to get news from the outside world. It ran thus: "Srinagar September 3rd—German Polish war outbreak. Russo-German treaty. Campbell." That was all. It seemed impossible to believe that Great Britain might be involved in war, and I told Lhakpa to cook a meal. While we were eating our *chapattis* I tried to tell him that the news was bad, that perhaps Englishmen were fighting, and that if it were true then the expedition would not go on to winter in Shimshal. He replied that the news was probably not as bad as I thought and that in any case there was no reason why we should not go on to Shimshal. I saw that privately he had summed me up as a pessimist. I had not the heart, nor sufficient command of the language, to give him further details, besides he was probably quite right. I poked my head out of the tent, but the thick mist hid everything except that it was still snowing. It had been snowing now for nearly forty-eight hours. I withdrew into the tent again, but the mist enwrapping my thoughts was as thick and as grim as that outside.

Shipton arrived during the afternoon with Angtharkay and Kusang. In spite of the bad weather they had managed to complete the last survey station of the Panmah Basin. We had been exploring and surveying this basin for the last three weeks until three days ago, when I had held the rope at the

top of Dessio's col while Shipton and his Sherpas descended on to the Nobande Sobande; we had then each crossed over to the Snow lake by virgin passes. I congratulated Shipton on the completion of an exceedingly good and useful piece of work and then showed him the telegram.

Until its arrival no news of the outside world had reached us for nearly three months during which time we and the inestimable Sherpas had lived amidst some of the most impressive scenery in the world. The Snow lake, formed by the confluence of four huge glaciers at a height of 17,000 feet and overlooked by the magnificent peaks of the Latok Group, had become familiar ground. Its difficult topography now held no secret from us. We had first entered the Snow lake from the Hispar pass and had then explored its northern branch. Shipton and I had then left it by the Biafo glacier which took us down to Askole, whence we had travelled through the Panmah Basin and had each re-entered the Snow lake from the east by two separate passes, so that there seemed little about it in all its moods that we did not know.

Because of all this, and because we had had to fight to gain our knowledge and to accomplish what we had set out to do, it seemed fantastic that fighting of a different nature should be going on thousands of miles away in Europe; fantastic that at such a distance it should affect us there as eventually it did.

For the next two days it continued to snow without ceasing, and we remained inside our small light-weight tent, reading, sleeping, eating, and conversing on a multitude of subjects; but no matter what the subject might be we always reverted to the topic of war. Owing to the wide separation of the members of the expedition we decided to carry on according to plan until we all re-congregated in Gilgit some time in October; then all doubts would be dispelled.

The weather on the morning of the 14th showed signs of clearing, and I prepared to set off down the Biafo glacier to Askole, where Mott, whom I was to join to assist in the survey of the Hoh Lungma and Chogo Lungma glaciers, was to have left news of his whereabouts. Shipton was to remain behind at the camp until the arrival of Russell, when they would explore a pass on the north branch of the Biafo glacier.

I set off in poor visibility accompanied by Lhakpa Tensing and Kusang; we took next to no food with us as Russell had said in his note that he had left some *ata* (flour) about two hours' journey down the glacier, together with some firewood. The previous three days' snow and the bad visibility made the going extremely difficult as the glacier was badly crevassed, and every step had to be probed with the ice-axe. The majority of the crevasses were completely covered over with a light bridge of snow, and on several occasions a snow bridge broke under me; but somehow or other we managed to get through the day and past the worst of the crevasses without disappearing completely from sight. Once, about an hour before we camped, I trod on what looked like firm snow, but what was in reality snow resting on a thin veneer of ice, and found myself waist deep in icy cold water.

Owing to these conditions we had been travelling very slowly; at the end of eight hours' continuous going dusk was approaching and there was still no sign of the food dump which Russell had left. We were all very cold and I decided to camp while there was yet sufficient light; for our supper we could

boil some water on the Primus. We made for the rocks of the moraine and just as we were approaching them I suddenly spied the dump about 200 yards away. I sent the Sherpas to fetch sufficient food and wood for the night and pitched the tent. An hour later we were warming to a hot brew of *tukpa* (boiled flour and water with spices added) and talking of the chicken, potatoes, and eggs we should soon be eating at Askole. Nevertheless it was a cold night.

Two days later, on September 17, we arrived in Askole. But we soon discovered that there was to be no realization of our anticipations. Mott was to have left behind a supply of certain foodstuffs, including chocolate and cigarettes which Secord had despatched from Skardu; perhaps more important still he was to have left a sum of money for me in the care of the Lumbardar, but to my horror he had left nothing except a note informing me of his movements and that he had taken the whole of the supplies down the valley to Chokpiong, thinking to save me the trouble of conveying it myself. It was doubtless done with good intent, but our disappointment was intense. The Sherpas looked so glum that I had to laugh. I determined that nothing would make me have another meal of *tukpa* or *chapattis*, and I ordered forty eggs, which I had scrambled that night, and for breakfast the following morning. It was all that I could afford.

The following day we set off down the Braldu Valley towards Chokpiong which we reached the same evening, after a long and tiring day's march. The first half of the march was very pleasant through numerous small cultivated villages where the harvest was being reaped. We were accompanied by two of the Askole coolies, Marcoli and Corbolani, whom I engaged to carry our loads as some compensation to my two Sherpa companions for their disappointment of the previous evening, and also to give them a slight rest. Consequently we were able to appreciate to the full the attractive scenery through which we were passing. The 2-foot wide track along which our route lay was like a bowling-green compared with the rough moraine of the Biafo glacier down which we had travelled the day before. The second half of the day proved less pleasant, being hot and dusty. We lost the track once or twice, and consequently found some rather rough going, so that when at last we reached Chokpiong we were tired but very eager to taste some of the delicacies which had been left there by Mott. But no money awaited me.

On September 21, three days later, Mott limped into Nangmoni where, realizing by a note from him that our plans would have to be revised, I had spent three days resting. I had bought a sheep on credit for six rupees, although there had been a little serious haggling about whether I should or should not pay the extra eight annas for its transport from its abode about 2 miles lower down the valley. Mott had for some time been suffering from some form of allergic rash which recently had been giving him more trouble, and he now had one or two painful and swollen glands. It was obvious that he would be unable to take part in the rest of our programme, and it was therefore decided that he should return to Gilgit *via* Shigar as soon as possible, where he would be able to receive adequate treatment. Lhakpa Tensing, who was suffering from a dental abscess, was to accompany him and have the tooth dealt with at Skardu.

In the meanwhile I was to carry on by myself with the most important

remaining item of our programme, the exploration of the Haramosh pass; the survey of the Hucho Alchori glacier and another minor glacier would have to be abandoned. The Chogo Lungma glacier, off the head of one of whose branches lay the Haramosh pass, was almost completely unexplored; it had only once previously been visited—in 1903 by Dr. Workman who had sighted the Haramosh pass and made a rough survey of the Chogo Lungma. The problem before us was whether the pass has a feasible means of communication over the main range between Arandu and Gilgit. It was a question which Shipton and I had discussed frequently during our sojourn on the Snow lake; on the whole we had been rather sceptical. The pass we thought might well be accessible from this side, but from our knowledge of the topography and such contours as there were on the existing map, the descent over to the other side appeared to be exceedingly steep and there might well be no way down.

On September 22 therefore, with Gyalgin and Kusang and the two Askole coolies, I said good-bye to Mott, set off up the Hoh Lungma glacier, and over

the Hikmul pass (18,000 feet), hitherto uncrossed, to Bisil. We then continued about 4 miles up the Basha river towards Arandu, where we intended to replenish our food supplies for the next part of the journey. But whereas Arandu is situated on the right bank of the river where it emerges from the mouth of the Chogo Lungma glacier, we were on the left bank, but hoped to cross it at Arandu by a rope bridge which was marked on our map. When we reached the spot where the bridge should have been we found that it did not exist. We were now in the exasperating position of being literally within a stone's throw of the fields of Arandu, yet separated from them by the roaring torrent of the Basha river, straight off the ice of the glacier. Moreover we were also cut off from the glacier itself by the waters of the Kero Lungma river almost as turbulent, which here joined the Basha river. Although we were so near the village that we could see the colours and details of the natives working in the field, we were a very long day's march from them if we were forced to retire to the next bridge lower down the valley. The only alternative was to try to ford the Kero Lungma river; this proved impossible, and indeed our attempt so frightened the two Askole coolies, who were looking

on, that when we gave up the attempt they immediately demanded to be released from their contract. I was only too glad to find an excuse to pay them off, as I could not afford to keep them any longer. At the suggestion of the Sherpas we decided to camp there for the night and make the attempt again the first thing the next morning, when the night frosts higher up might have caused a diminution in the volume of water coming down from the snow line.

At daybreak I tied one end of the alpine rope to my waist and, while the Sherpas held the trailing length behind me, I pushed forward into the current. The flow was still exceedingly forceful, and above the noise of the rushing water could be heard the rumbling of boulders as the current carried them down. The water was waist high, and since it came directly from the glacier, was intensely cold; by the time I was approaching the opposite bank—the stream was about 70 yards wide—I had lost all sensation in my legs which would scarcely move. I had to judge when my feet were resting on the bottom and trust to luck that they were on a firm boulder, until finally I fell forward on to a protruding rock and pulled myself to shallower and gentler water and so to dry land. I then held the rope while the Sherpas crossed in a similar manner. A short while later we were in Arandu.

Finance was now becoming acute as I had only twenty rupees remaining. Should the pass be practicable this would be ample; on the other hand, should it fail I wished to cross by the Bolucho La to the Kero Lungma glacier and explore one of its tributaries before returning to Gilgit by following in Mott's footsteps, a journey which would take at least three weeks. In this case we should inevitably fare rather badly. I was therefore forced to exercise the greatest economy. Our food, until we knew the outcome of our wanderings, was to consist entirely of *ata*, tea, and a little *ghi*. I tried to engage a coolie to come with us for the first two or three days in order to ease us of our loads, which were considerable, but no one showed any willingness to help us unless I engaged a pair and would pay for their return journey. This I was unable to afford, and was contrary to custom, so accordingly we set forth by ourselves, the Sherpas carrying 80 lb. apiece, while I myself shouldered a modest 60 lb.

I was now in a hurry to push forward as I was afraid that the weather would break again and one more bad spell, such as we had experienced on the Snow lake, would have made the further crossing of high passes out of the question for the season; we had now had fine weather for ten days, and according to the law of averages, as established by us, we were due for a bad spell at any minute, if not overdue. The journey ahead of us, therefore, to add to the excitement of discovering a new and important pass, and to the state of our finances, became a race with time and the weather.

We left Arandu at about midday on September 26 and crossed over the rough lower end of the glacier to the ablation valley lining its left bank. After two and a half hours of pleasant easy going along this smooth wide valley, I decided to camp on a flat sandy stretch at the edge of a small thicket. There was plenty of wood here and I thought it would be a good opportunity to enable the Sherpas to convert our *ata* into *tsampa* as well as lightening

their loads by the amount of that evening's and the next morning's meals. *Tsampa* consists of flour which has been roasted and so made digestible; in this state it can be eaten raw, when it is inclined to be inhaled into the lungs and to cause much coughing and distress, or it can be mixed with sugar and sufficient water to give it the consistency necessary for moulding it into a sort of cake, or again it may be taken on a spoon and dipped in tea. It is in fact extremely adaptable, with the advantage that once it is *tsampa* it need never be cooked again, thus effecting a great saving in fuel, a point which we should have to consider.

The next day we continued up the pleasant ablation valley, although we soon got beyond the belt of trees, except for a certain amount of dwarf willow. On one occasion we disturbed a herd of *bharal* and I wished that I had brought the rifle with me. We passed a couple of valleys leading off from the opposite bank, and I determined that if the Haramosh pass proved a failure I would try to cross the range from the heads of one of these glaciers. That evening we camped at the extreme limit of the willows on the north bank of the glacier; from now on unless the willow belt were prolonged on the opposite bank we should have to use the Primus stove for cooking. But that night, after taking a round of compass bearings, I sat with the Sherpas round the fire and ate *tsampa* while they cooked the tea. I drank my tea lying in my sleeping-bag, watching the glow of the fire on the faces of the Sherpas, and then sank back to gaze at the stars and fall asleep to the drone of Kusang's prayers.

The next day we crossed over to the southern side of the glacier, and camped on a rocky outcrop at about 14,000 feet and 20 miles from Arandu, after experiencing a cold wind which had been blowing down the glacier for the last two hours of the march. No question at this camp of lying in a sleeping-bag and falling asleep under the stars; as I went to take my evening round of compass bearings I was struck by the autumnal tint of the fading willows on the mountain sides below me. We were now definitely back in the inhospitable regions where one has that feeling of having to fight, of everything being against one; a sort of claustrophobia which seems ridiculous, almost paradoxical in all that vastness. When the tea was ready, the Sherpas too came into the tent.

We awoke the next morning to a watery dawn and much low cirrus cloud, but my early morning pessimism later turned out to be unwarranted, and before long there was not a cloud in the sky. From now onwards we took to the ice, and after half an hour we came to a tributary glacier on our left; it appeared to run uniformly and fairly gently upwards into the distance for about 8 miles, where it ended in the Haramosh pass. It was an exciting moment, the first sight of the pass from this side. The pass was distant but inviting, and there were apparently not many difficulties to be anticipated in the ascent. A long snow slope, steepening in the last few hundred feet, ran up to the col which lay beneath the towering slopes of Haramosh itself on the left, while on the right it blended with a comparatively low rock ridge forming the right bank of the glacier. We were eager to push on, to look over the top and to get a glimpse of the promised land beyond. For the rest of the day we wove our way in and out of the intricate maze of crevasses and camped

Hikmul pass

Panmah col

Dessio's col

Looking up Chogo Lungma from Hikmul pass

Haramosh from Haramosh pass

that evening half-way up the glacier on the bare ice at a height of about 15,000 feet. While a hot brew of *takpa* was being made I got into my sleeping-bag and put my socks outside to dry; when I put my head out of the tent to bring them inside it was obvious that we were in for a very cold night. My socks were frozen stiff and the full moon in a clear sky shone down on the mountains from almost overhead, casting scarcely any shadows yet cloaking the peaks in a cold and lifeless luminosity. The stillness was broken only by the sharp reports caused by the process of the evening freezing. Cold is curiously and insidiously demoralizing, and I thought with some trepidation of the snow-covered crevasses which lay before us on the morrow in contrast with the snow-free ones which we had encountered during the day.

I soon withdrew into the greater warmth of the tent, and we discussed the prospects of to-morrow, what lay at the summit and on the other side of the pass, until, the three of us huddled together for greater warmth, I at length fell asleep. But there was no doubt that the immediate future was as exciting to the Sherpas as it was to me. It was not the nearness of Gilgit and the flesh-pots alone which thrilled them should our endeavours succeed; they also were filled with the simple but indefinable urge to press forward.

It was a bitterly cold night and we all slept fitfully. Kusang was up at six o'clock the next morning of his own accord, cooking some hot tea, although normally it would have been no easy task to get him up at this hour and before it was light. But now we wanted the warmth of hot tea and the movement of the march. We struggled into our boots with difficulty, for they were frozen hard as iron and remained thus for the next six hours. At first we made excellent, rapid progress on a good hard frozen surface, but at the end of an hour the surface suddenly deteriorated and the pace became funereal. From now onwards for the next four hours we were knee and at times even thigh deep in snow at every step; such conditions at a height of 16,000 and 17,000 feet under the burden of 50 and 60 lb. loads were intensely fatiguing, and very frequent rests necessary. But though after a while I began to despair of reaching the summit that day, at last, after negotiating the giant crevasses at the top of the last steep snow slope, we reached the foot of the rocks and a few minutes later had scrambled to the top.

What lay beyond was the all-important question. It was a memorable and impressive sight which met our gaze, a sight which drew forth gasps and murmurs of wonder from the Sherpas themselves. Most of the high passes of the Karakoram Himalaya fall away gradually into the distance, or perhaps steeply for the first 1000 or 2000 feet, so that the varying bands of vegetation merge gradually into one another: first the grass, then the dwarf willows and juniper, followed by the deciduous and coniferous trees; the last two are often at such a distance as to be invisible and indeed the conifers are often lacking entirely. At eye-level further snow peaks and glaciers bound the horizon. The effect from the top of the Haramosh pass was entirely different. No gentle slope existed here; the rock face gave the impression of dropping almost sheer for 4000 feet, while the true valley glacier, forming the slopes of Haramosh itself, hung suspended about 200 yards away on our left until it also reached the smoother ground below, to bend suddenly into a gentle stream of moraine-covered ice and disappear round the corner into the

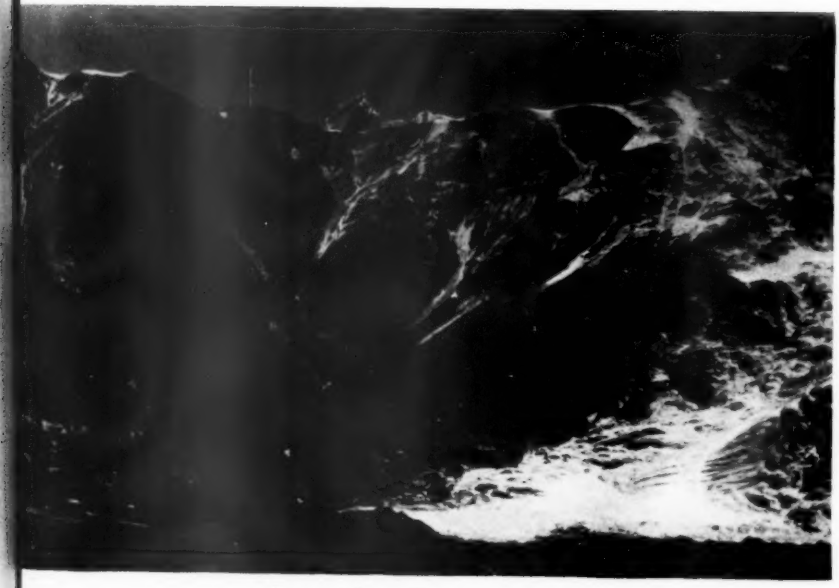
distance. At the foot of this precipice was a short stretch of grass which suddenly entered the golden belt of fading willows and silver birch; and just beyond this, as though luring us away from autumn to an evergreen country, was the thick rich dark belt of the conifers. In the distance lay a blue mass of hills, steep perhaps but gentle and warm and with no sign of snow. The whole scene was a superb mass of colour, inviting, safe, and hospitable. It looked, too, as though we had only to jump in order to be clear of all perils and find ourselves amongst those friendly trees. But it was this thought which made us pause: there was no obvious route of descent. I told Kusang to look for a route while Gyalgin mended my braces, which had come apart on the ascent, and I prepared to take bearings.

I turned to look back at the way we had come. This view too was beautiful but it was grand, austere, and vast, and it was because it existed that we had voluntarily undergone the privations of the last three months. As I looked back on it all, the clean white glacier sweeping in a gentle curve to join the Chogo Lungma, and the familiar peaks beyond, which every now and then were lost in fierce and threatening masses of cloud, a pang of regret shot through me, in spite of the triumphant sense of accomplishment. By the time I had finished taking photographs and bearings and making rough sketches, I discovered that the Sherpas, who were as thrilled and impressed as I was, had erected a cairn fully 5 feet high; I assisted them with the final stones.

It was now four o'clock in the afternoon, and high time that we were on our way. I looked at the route which Kusang had chosen and was not impressed by it. But at all costs we must reach that rich tempting valley below, and the alternative of having to retrace our hard-won steps convinced us that the route must succeed. I tentatively suggested to the Sherpas that we should camp the night up there, as I thought that at this hour we should be exposed to falling stones; but neither of them would hear of it, the temptation down below was too great. I looked at the gathering clouds, and we set off. For the first hour the going was very steep, over loose rock and patches of soft snow, and great care was needed as a slip would have been difficult to stop. Kusang, who had rushed ahead at the start, was some distance in front while Gyalgin lagged considerably behind. After a while, at a point where the slope seemed to be getting steeper, I began to wonder whether we should reach a camping site before dark and felt that we should be safer roped together. I shouted to Kusang, who was carrying the rope, to stop, and when I caught up with him he told me that the slope was beginning to ease off a little, and this appeared to be true. While I was talking to Kusang I suddenly heard the clatter of a tin falling from above, and looking up I saw a cigarette tin and cigarettes flying through the air; we watched them disappear out of sight, and then both Kusang and Gyalgin, off whose pack they had fallen, burst into peals of laughter and back-chat. But I was sorry for them as they had no more cigarettes, and I myself had only a little tobacco left.

We advanced more easily now, but before long real danger threatened us, falling stones induced by the evening freeze-up which was now starting. This was the danger I had foreseen while on the summit. Stones of all sizes were falling, whistling and bouncing continually all around us, as we were forced to travel down the small gullies, the natural catchment area of these missiles.

Summit of Haramosh pass



Descent from Haramosh pass

Looking east from Haramosh pass

Valley west of Haramosh pass, avalanche in foreground

Once, when cutting our way across a gully with one foot precariously placed in an ice-step which I had just made, I saw a large red stone about twice the size of a cricket ball hurtling down; I paused in my step-cutting to let it pass, which I judged it would do by a safe margin. But when about 5 yards away from me it bounced and split into two, one fragment made a bee line for my head, and only by hastily ducking did I avoid more than having my hat tilted by it. A short while later, on hearing an ominous whistle, I looked up and saw one of these missiles hit Kusang in the back, but he was saved by the padding of his rucksak, which was cut.

We now hurried on with all speed to reach our objective, the first grass bank and flat piece of ground we could see for a camp, before darkness fell. An hour later we were safe and had found to our joy that close at hand a clear spring was bubbling up through the ground as though it were a reward for our efforts, and an invitation to camp. We were safe and the pass was ours.

That night we slept peacefully under the stars before a fire of dwarf willow at the base of the pass till the sun rose upon us at half-past nine the next morning. As we breakfasted in the sun, for the fine weather still held in spite of threatening dawns and sunsets, we gazed up at our pass and the pure white Haramosh which formed its southern lip, and again I was touched by a pang of regret. As we gazed at Haramosh towering 8000 feet above us with her face covered by hanging glaciers there was a groan swelling to a long low roar as a glacier fell and the avalanche swept 4 miles down the valley. We were only 100 yards away from its course and felt its breath as it rushed past us and filled the whole valley with a dense cloud of whirling snow. After descending another thousand feet we entered the belt of silver birch where the birds and the Sherpas sang as we swung along at an easy pace on a track which soon brought us to the Guja village of Kortuwan. Here the natives were much surprised, for we appeared to them to have sprung from nowhere, and when we pointed to the pass they expressed astonishment; no one ever before had reached their village except by coming up the valley. We were given bread and milk curds. Soon after leaving Kortuwan we entered the pine belt and had a delightful walk through alpine scenery for the rest of the day; moreover I was now able to find and pay a man a rupee for carrying my rucksak.

In the evening we camped at the first real village we had seen, a place called Iskere, where we again caused surprise. I was presented with wild grapes, and some dried apricots, and we had the first vegetables we had tasted since leaving Chokpiong. About an hour or so after we had eaten, twelve rather superior, smart young men approached me, and pressed my two hands between their own which they then crossed and pressed against their breasts. One by one they squatted in a row in front of me and started talking to me in a buzz of Urdu incomprehensible to my limited knowledge of the language. However the Sherpas gave them an account of our travels while I occasionally put an elaborately worked out question. I should like to have slept in the open, but so great was our popularity that I was forced to use the privacy of our tent. Gilgit, I also discovered from them, was less than 60 miles away—a three-day march.

We left the fascinating pine belt soon after leaving Iskere and entered the

arid desert belt. About midday we reached the pretty little village of Daso, where we sat ourselves down for lunch under some apricot trees interwoven with vines and the Sherpas again gave an account of our travels—an account which I felt sure did not lose in the telling. Soon I was presented with a small but delicious melon and cucumber, which, together with some eggs which I was able to buy, provided an excellent lunch. Discovering my medical proclivities during their exchanges with the Sherpas, the villagers soon brought forth the chronic invalids of the place for me to cure, and I solemnly dispensed aspirin, bismuth, and opium to them, ringing the changes on the times at which, and with what foods the drugs were to be taken, until finally I had none left; and so great can human faith be that I have no doubt that some at least of my patients were relieved of their symptoms for a short period. But what faith is to the recipient so is gratitude to the donor, and I was touched, after this hypocritical dispensing, to be asked to stay the night in the village and to be fed free of charge. After I had declined and expressed my thanks, the *lumbardar* followed me to the boundaries of the village, and there stopped me; if I stayed the night, he said, I might then borrow his horse the next day for a nominal sum of 4 annas. I thanked him, for his gratitude as much as for his offer. We camped that evening at Hanuchal on the banks of the Indus.

We left Hanuchal at nine o'clock on the morning of October 2 and marched the whole day along the desert valleys of the Indus and Gilgit rivers. It was a long march of 25 miles in the course of which we never once came across a stream at which to quench our thirst; consequently, when we reached Chamongarh in darkness we were tired and thirsty. There was a Dak bungalow here, and I was provided with a table and chair and a red carpet. The Sherpas placed the usual enamelled mug of black tea in front of me with a plate of *tsampa* and I proceeded avidly to quench my thirst. While I was doing this the *lumbardar* came up to me followed by a servant bearing a tray, on which were laid out a refined china tea set and a couple of boiled eggs and bread and butter, so that I felt rather ashamed of my own ware. He was a most affable old man and politely offered to do anything that he could for me, and detailed a servant to massage my legs. Being only one day's march away from Gilgit, he knew of the expedition and therefore expressed no great surprise at the uncouthness of my condition.

While all this was going on I once again made the inquiry, "Is England at war?" And looking up to heaven and clasping his hands together, he called on Allah and told me the bitter truth. I felt dazed, bewildered, and anxious. While the rain fell I ate my supper of chicken. The weather had broken at last. How could it do otherwise?

I rose leaving the chair, table, and red carpet and carried the remainder of the chicken to the Sherpas where I squatted on the ground beside them and talked to them while they ate the last chicken I should ever give them. After discussing the incidents of the last three months I broke the news to them and told them that we should not go to Shimshal, but they did not understand its portent; it was all so far away.

The following morning we set out for Gilgit, and I was deeply touched at the *lumbardar's* refusal to accept any payment whatsoever for our night's

lodging. We covered the 17 miles to Gilgit in five hours and there confirmed the news. As I approached the station I felt that, although I had enjoyed the simple life which we had been living and did not want it to end, nevertheless it would be pleasant once again to live as I had been born to live. But I felt also a deep content in the accomplishment of a difficult task and in the knowledge that I had a host of unique memories which nothing that the future held could ever take away from me.

THE NATIONAL AIR PHOTOGRAPHIC LIBRARY OF CANADA

Contributed by the Mines and Geology Branch, Department of Mines and Resources, Ottawa

AIR surveys in Canada were initiated by the mapping organizations of the Dominion Government some twenty years ago. They were found to be so well suited to Canadian conditions that they were continuously expanded until they became the basic mapping method in Canada, to the virtual exclusion of older types of work, and various other uses for the air photographs in forestry and engineering were also developed. It was early decided to establish a central repository in which copies of all air photographs taken for any branch of the Federal Government would be filed and made available for the use of other branches and the public. This was the origin of the National Air Photographic Library, and the course of events has amply demonstrated the wisdom and foresight of those responsible for its foundation. It now includes some eight hundred and twenty-eight thousand prints from aerial negatives, covering an area of approximately 840,000 square miles, and constitutes an invaluable record of the topography, forest cover, and cultural features of this vast area.

Originally the Library was a division of the Topographical Survey of Canada. With the organization of the Department of Mines and Resources in 1936 it became a part of the Bureau of Geology and Topography, which carries out the topographical and air surveys of that Department.

The Library now comprises one print from all negatives exposed by the Royal Canadian Air Force and a print from each negative exposed by commercial flying companies under contract to the Dominion Government. In addition, a large number of prints have been obtained from Provincial Governments and from Departments of the Government of the United States whose activities have made it necessary to photograph areas adjacent to the International Boundary. The Library also keeps up-to-date records with regard to areas photographed by Provincial Governments and private enterprise. Details of the film used, filter, exposure interval, lens, elevation, date, time, and all other relevant data, are recorded for each roll of photographs.

Each photograph carries a serial number for the roll and an individual number for the photograph itself, and is indexed in its proper geographical position on a reference map. The key index to the Library's reference maps

is the index to the Maps of the National Topographical Series. Oblique air photographs are recorded on maps of this series on the 4-miles-to-1-inch scale, and vertical photographs on maps on the 1-inch scale. In areas where these maps have not as yet been published, temporary index maps conforming to the boundaries of the National Series, are prepared from the best available information. These temporary maps are retained until the final map is published, when a new index is prepared with the positions of existing photographs accurately shown thereon. The numbers of the map sheets on which the individual photographs of each roll are indexed are recorded in a card index.

The photographs are filed in fire-proof steel containers each holding approximately two hundred and twenty-five photographs. These containers are filed on specially designed steel shelving and are numbered with the same numbers as the index maps in the map reference index; that is, photographs indexed on Map Sheet 21 H/5, are filed in containers also numbered 21 H/5. Also, the filing system is so arranged that, if for any reason additional photographs are taken over a map sheet area already photographed, these new photographs, when indexed, may be placed on the shelves adjacent to those already on hand. The whole filing system is so conveniently arranged that the photograph covering any particular area can be found within a minute or two.

Although the primary purpose of the Library is to avoid duplication in air photography and to make photographs taken for one department of the Government serve other departments which may be interested in the same areas, it has been of great service also to those organizations and interests engaged in the development of Canada's natural resources. To understand the use made of these air photographs, it should be realized that much of the development of recent years has been in the northern parts of the country, in which, if mapped at all, the maps show the planimetry only, and where, owing to the wooded and broken character of the country, surveys and even reconnaissance are difficult, slow, and expensive. With the photographs, the forester, the geologist, the prospector, or the engineer, can study his terrain before going into the field. The forester can obtain a good idea of the timber and transportation problems; the prospector or geologist can eliminate from his programme areas that are heavily covered with drift and can commonly obtain indications of the character of the rocks and structural features; and the engineer can determine the most favourable route for the road, railway, or transmission line he may be constructing, or can study the problems of a reservoir or power development, and direct his field work toward the most important and critical features. All this makes for a great saving in time and energy, and at the same time gives the assurance that no important feature has been overlooked.

Land surveyors find the photographs of assistance in tracing old boundaries and sportsmen and tourists make a wide use of the Library in planning canoe or fishing trips, or in determining the details of territory leased for hunting or fishing. Since the outbreak of the war military and Air Force officers have constantly referred to the Library for information needed for the location of flying fields, training areas, and coastal defences.

The negatives of practically all photographs in the Library are filed by the

Royal Canadian Air Force and prints may be obtained through the Library at nominal cost. In the past three years a total of about one hundred and seventeen thousand prints have been purchased through the Library, or an average of nearly forty thousand a year, which gives a very good indication of the service given by the Library to a wide variety of interests. Lumber companies, mining companies, geologists, and prospectors are the largest purchasers. At present many areas adjacent to our coasts and other districts of military importance are withheld from private purchase or inspection to ensure that information of value to the enemy is not made available.

Facilities for the inspection of prints are provided in the Library and stereoscopes are available if required. A small staff of experts are prepared, if necessary, to give assistance and advice in the interpretation of the photographs, to ensure that full value is obtained from their use. In the early days of the Library this was an important feature of the work, as only trained aerial surveyors had any familiarity with air photographs, their limitations and possibilities. Now that their use has spread so widely, many foresters, geologists, and engineers have acquired a knowledge of the use of the photographs.

Many of the inquiries at the Library have been intensely interesting, and have provided a full opportunity to determine the extent of the information which can be obtained from the photographs without field work. As an example, a power company controlling a large lake reservoir for water storage desired additional water and was considering the possibility of diverting a small stream from another watershed. The stereoscopic examination of a few pairs of photographs indicated that this diversion was feasible, determined the best site for the diversion dam, and where ground surveys should be made to confirm the possibility of the diversion. Subsequent surveys made at the cost of a few days in the field, confirmed that the diversion was possible and economically sound.

A few years ago a railway was proposed for a new mine. The suggestion was made by a prominent mining engineer that this railway be built somewhat to one side of the direct route in order to tap a section of country that was considered interesting from a mining viewpoint. One of the railway engineers came to the Library to get information on this proposal from air photographs which were available. Knowing the terminal points of the railway, it was found possible to make a rough location, scaling from the photographs the various types of construction necessary, such as heavy rock cut, light fill, side hill cut, and so on. The engineer was able to make an estimate from this information which showed that the proposed diversion was much more costly than the direct route, and the project was rejected without any field work whatever. The most common type of reference to the Library is the case where it is possible, by an examination of the photographs, to direct the inquirer to the critical points of his problem, and to indicate how it can be investigated with a minimum of field work. Many examples could be cited of the assistance given by the Library to road, railway, and transmission line location, water-power projects, and to forestry and even geological work.

From the purely scientific standpoint the Library is perhaps the most complete record of physiographical features in the world. Photographs are avail-

able which show classic examples of folding and faulting, of glacial features such as moraines, eskers, and sand plains, of landslides, stream terracing and erosion, and of delta formations. These have added greatly to the knowledge of Canadian physiography and in particular to the study of glaciation and glacial movements. It might be noted that on the mid-western prairies a series of parallel markings have been seen on air photographs, covering an area some 20 miles long by 4 or 5 miles in width which have not as yet been explained by any geologist or physiographer, and which, so far as is known, have not been found elsewhere.

The Library also maintains a separate so-called scenic collection, comprising photographs of towns and cities, scenic features, industries, and other items of interest, which are available for publication to illustrate articles and booklets and for general publicity purposes.

In this account of the work of the Library it should not be overlooked that nearly all the photographs were originally taken for mapping purposes. The additional uses in industry which are outlined above are really in the nature of a continuing dividend on the original expenditure. There is no tendency to over-emphasize these uses of the photographs which have been developed as supplementary to the map, the primary object of air photography in Canada.

DEVELOPMENT OF MINERAL RESOURCES IN CANADA

Contributed by The Mines and Geology Branch, Department of Mines and Resources, Ottawa

CANADA, with its 12,000,000 people and its 3,700,000 square miles of territory, lies north of the world's greatest industrial nation and is part of the world's largest Empire. These two factors have been of great importance in the economic development of the Dominion and the success of this development is nowhere more apparent than in the growth of the country's mineral industry. From a total of $64,400,000 in 1900, the annual value of Canada's mineral production had increased to $211,300,000 in 1918; to $311,000,000 in 1929; to $474,600,000 in 1939; and to a peak of $554,000,000 in 1941. These figures represent progressive stages in the building up of an industry that has placed Canada far in the lead in the production of nickel, the platinum group of metals, and asbestos; that has made her second in importance to South Africa in the production of gold; that has given her a leading position in the output of copper, lead, zinc, silver, radium, selenium, tellurium, and several other metals; and that produces as well, coal, crude petroleum, natural gas, and peat, and a long list of non-metallic minerals.

Canada's greatest headway in mineral development has been in the production of gold, the value of output of which in 1941 reached a peak of $205,000,000. This amount is higher than the total for all other metals, and compares with a value of $58,094,000 in 1931. Until then, by far the greater

part of Canada's gold output came from long-established mines in the Porcupine and Kirkland Lake areas of Ontario. Elsewhere in the country, apart from certain base metal properties which recover gold as a by-product, there were few mines with a substantial production of the metal.

Prospectors were in need of an incentive, which came toward the close of 1931, when the price of gold began to rise. This rise in price and the later fixing of the price at $35.00 an ounce, proved to be the greatest event in the history of Canadian gold mining. Discovery followed discovery, and properties that had long been inactive again received attention, so that within a few years areas which had been little more than a wilderness were being transformed into thriving mining communities. Record after record was established in the quantity and value of gold output, and in 1938 a total of thirty-five gold properties entered production. Quebec, which had produced comparatively little gold prior to 1930, became one of the leading producers of the metal in the Dominion. In Ontario, Manitoba, and British Columbia however a considerable part of the increase in production came from deposits that had either been abandoned, or showed little promise of successful development. Many of them are within easy reach of rail transportation and among them are several properties in the Kirkland Lake, Porcupine, and nearby areas.

With the exception of those of Nova Scotia, all Canadian gold deposits occur in the rocks of the Canadian Shield and the Cordillera. These vast geological provinces are also the sources of all but a small part of Canada's output of the other metals. Large portions of them adjacent to the main water routes and transportation systems have been geologically explored, but many years will be required fully to determine their possibilities. It is recognized however that much of the Canadian Shield and the Cordillera offer little hope of metal or mineral production.

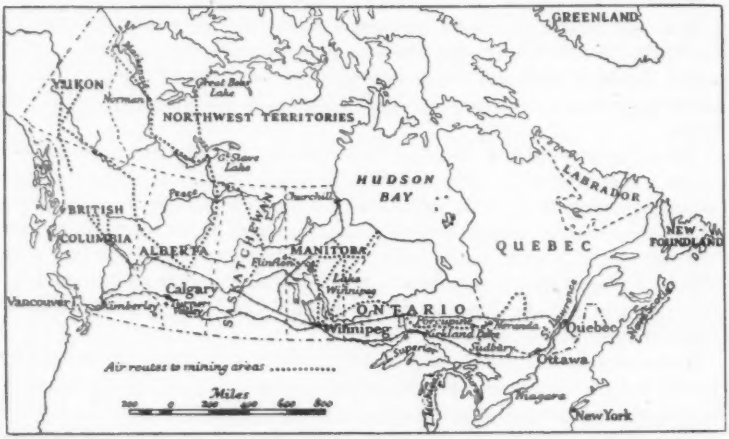
An important contribution to gold development in Canada is the abundance within the country of cheap hydro-electric energy. Cheap power is within easy reach of most gold mines, as also of most Canadian industries. Another important feature is the aid rendered by Dominion and Provincial Government organizations. These services, as they apply to the Dominion Government, include the geological mapping of promising areas, the devising of ore treatment processes, fuel research, and economic studies of sources of supply and uses. Most of the gold-milling plants in operation in Canada are using treatment methods, or modifications of methods, devised by metallurgists of the Dominion Department of Mines and Resources.

Although production continues to increase, prospecting for gold in Canada is much less active than was the case prior to 1938. There are various reasons for this, one of them being the changing conditions arising from the war. Less money is available for the financing of gold properties and most of the attention is being given to metals required for the manufacture of munitions and other war equipment. It is likely also that most of the easy finds have been made, and although large regions have as yet been little explored, the search for gold deposits in the future will require the increasing use of scientific methods.

Canada in 1941 produced the base metals, nickel, copper, lead, and zinc to

a total value of $166,157,000, the amount being higher than in any past year and contrasts with $155,923,000 in 1940, and with $136,277,200 in 1939. Although less spectacular than that of gold, the history of base metal development in Canada is striking. Among the earlier events of outstanding importance was the discovery in 1885 of the copper-nickel deposits of the Sudbury area, Ontario. Next in importance was the discovery of the huge lead-zinc-silver deposits at Kimberley, British Columbia. Provided that the deposits could be successfully developed, these discoveries alone would have enabled Canada to attain an important position as a base metal producer. Other discoveries followed however the two most important of which were the discovery in 1915 of the Flinflon copper-zinc deposits which straddle the Manitoba–Saskatchewan boundary, and of the Horne copper-gold deposits in 1920 at what is now Noranda, Quebec.

These discoveries marked the first stage in the building up of a base metal



industry in Canada, but especially in the cases of the Kimberley, Flinflon, and Sudbury deposits, many difficulties had to be overcome before production was established on a successful basis. In fact, it was not until about 1925 that Canada began to receive world-wide attention as a producer of the non-ferrous base metals. It was about that time that the larger producers undertook programmes of development and expansion, which, in effect, were intended to coordinate their mining, smelting, refining, and fabricating facilities and to enable them to take full advantage of the increasing world demand for their products. Carried out at a total cost considerably in excess of $100,000,000, these programmes provided Canada with great metallurgical plants, including a nickel refinery, two zinc refineries, a lead refinery, and two copper refineries, strategically located across the country.

As Canada in peace-time uses only a small part of its base metal output, the large surplus production of copper, lead, zinc, and nickel was available for export. This meant competition in world markets, which in turn meant that production costs must be sufficiently low to enable the producers to compete

on a profitable basis. In this respect, Canada has one important advantage over most other base metal producing countries in that most of the deposits of these metals have a content of one or more of the precious metals much higher than the average. From the copper-nickel ore bodies of the Sudbury area, for instance, comes Canada's output of the platinum metals, the Dominion being the leading producer of these metals. Considerable gold and silver is also recovered from the deposits. Likewise, the copper-zinc deposits at Flinflon are the source of most of Manitoba's output of gold, while the Horne mine at Noranda is one of Canada's leading producers of gold. In effect, this precious metal recovery means a lowering of production cost in the recovery of the primary metals.

Most of the exports of copper, lead, and zinc prior to the war were marketed in Great Britain and that country and the United States were the chief consumers of Canadian nickel. Since the commencement of the war there has been no concern as to the disposal of the surplus output of these metals, the chief problem being to produce them in tonnages sufficient to meet the steadily increasing demands.

For several years prior to the war, the prices of copper, lead, and zinc were too low to encourage an active search for new sources of supply, or, with some exceptions, to encourage the operation of idle deposits. Accordingly, much the greater part of Canada's output of base metals continues to come from the deposits at Kimberley, Flinflon, Sudbury, and Noranda. Those at Kimberley are the source of practically all of Canada's output of lead, of approximately 80 per cent. of its output of zinc, and close to 50 per cent. of its output of silver. They are also the source of Canada's production of tin which was commenced in 1941 and which amounts to about 500 tons of refined metal a year, of most of the Canadian output of cadmium, and of the entire output of bismuth.

From the Flinflon deposits Canada obtains a large part of its copper, and about 10 per cent. of its zinc, in addition to which, gold, silver, cadmium, tellurium, and selenium are recovered. Although best known as a source of nickel, the copper-nickel deposits at Sudbury contribute the greater part of Canada's output of copper and in fact are one of the largest world sources of this metal. Prior to the war, the value of gold production from the Horne mine at Noranda frequently exceeded that of copper. This mine is also an important source of silver, tellurium, and selenium.

Thus Canada's importance as a producer of base metals can be traced mainly to the discovery over a period of years of huge deposits of the metals; to the foresight shown by the producing companies in bringing their productive facilities into line with the possibilities of the export trade; to the relatively low costs of production; and obviously to the widening use of metals in industry.

Quite apart from the achievement itself, the successful development of this branch of mining and of the gold mining industry represent an outstanding contribution to the industrial growth of the Dominion. Until about twenty years ago this growth was based mostly upon the production and export of the products of the farms and the forests and there was a need for a large-scale metal development to round out the Canadian economy. This large pro-

duction of metals has, to an important extent, made possible the building up of manufacturing industries within the country; it has provided new outlets for the products of these enterprises and of other Canadian industries; it has opened up new avenues of employment for tens of thousands of Canadian workmen; it has paved the way for the settlement of regions that might otherwise have never been settled; and of present significance, it led to the development of the use of the airplane in Canada.

Years before the present war, Canadian flyers were gaining valuable experience transporting men and supplies and equipment to distant mining areas; far up into the Arctic regions; over the forested wilderness of northern Ontario and Quebec; into Yukon Territory; over the mountains of British Columbia. Far more freight has been transported by air in Canada than in any other country and most of this freight is for use in metal mine development. Mine equipment, mill equipment, drills, lumber and timber, and even horses, cattle, and hogs have been transported into mining areas by airplanes, piloted in many cases by men who had won distinction as flyers in the war of 1914–18.

Dating back to 1920, when engineers of a Canadian oil company made the trip to Norman in the Northwest Territories by air to choose sites for oil drilling, the use of the airplane in mining operations in Canada had become widespread by 1930. It was used by Gilbert LaBine in May of that year when he discovered the ores of radium on the east shore of Great Bear Lake, and it has largely made possible the mining development that has since taken place in the Northwest Territories. The airplane is also of particular importance in geological field work and in aerial photographic work.

With the important exceptions of the ores of aluminium, iron, chromium, tungsten, and manganese, Canada is self-sufficient in metallic minerals. As a result largely of her abundance of cheap electrical energy, the Dominion is a leading producer of aluminium, but the bauxite is all imported. Most of the iron ore is also imported, mainly from the United States and partly from Newfoundland, although it appears likely that developments now under way will eventually make Canada largely independent of outside sources. As a result of recent developments also, Canada is producing more than sufficient mercury and antimony to meet its needs, but is much less fortunate with chromium, tungsten, and manganese. The Kimberley production of tin is also far short of requirements. These shortages however are of real concern only in war-time, and have no important bearing on the peace-time development of mining.

Canada's production of the non-metallic minerals and the fuels is used mostly within the country, the chief exceptions being asbestos and gypsum. Accordingly the peace-time production of many of these minerals is governed largely by the domestic demands, and frequently by localized demand. Transportation costs are important in the marketing of several of them, and that, together with Canada's small population, hampers the development of deposits too far from populated areas and industrial centres.

The production reached a record total value of $160,700,000 in 1941. As in the case of the metals however the establishing of this record is more the result of urgent war demands than it is evidence of further progress in the

development of the industry. This growth prior to the present war, though not particularly striking, was steady, and in recent years has been marked by the success of oil-drilling operations in the Turner Valley field of Alberta; by the establishment in Canada of a rock wool industry resulting from the discovery of a supply of suitable raw minerals in the Niagara peninsula of Ontario; by the more recent disclosure of large deposits of brucitic limestone in Ontario and Quebec and of deposits of nepheline syenite in central Ontario; and by the still later expansion in the production of peat in Eastern Canada. As a contributor to the national income, the most important of these developments is the production of crude petroleum in the Turner Valley field, the value of which in 1941 amounted to approximately $13,000,000. This field is the source of about 95 per cent. of Canada's output of crude petroleum, the other producing areas being in south-western Ontario, New Brunswick, and near Norman in the Northwest Territories.

In the development of its resources of coal, Canada has been handicapped by the geographical distribution of the deposits. Nova Scotia and Alberta, the principal coal-producing provinces, are many hundreds of miles distant from the industrial Ontario and Quebec, both of which provinces have to import most of their requirements. To assist in overcoming this, the Dominion Government grants subventions in the movement of the coal from Nova Scotia to points in Ontario and Quebec and from western Canada to points in Ontario. The movements of coal under assisted rates total several million tons a year.

The chief source of crude petroleum supply is also far distant from the large consuming centres, but the Canadian output in any event is not quite sufficient to meet the present needs of the three Prairie Provinces, and thus no Government financial assistance is provided in the marketing of the petroleum. Natural gas is produced mostly in Ontario and Alberta and is used locally, the total value of output in 1941 being $12,400,000. Although occurrences are abundant, the production of peat moss and litter in Canada prior to the present war was intermittent and small. New interest was shown however as a result of the war. This led to the erection of several plants which are now in steady production, the United States being the chief market.

In its production of such minerals as asbestos, gypsum, salt, mica, sulphur, sodium sulphate, rock wool, barite, building stones, and clay products and other structural materials, Canada is provided with most of the raw materials required in the processing of metals, in the manufacture of chemicals and other products, and in the construction industries. The importance of this was never more apparent than during the present war, for it would be next to impossible to obtain the necessary supplies from outside sources.

The progress made during the past fifteen to twenty years in the development of these minerals is largely a case of one branch of mining providing outlets for the products of another. Refractory raw minerals, for instance, are needed in steadily increasing quantities in the smelting and refining of iron, nickel, copper, lead, and zinc, and large tonnages of building stones and other structural materials were required in the construction of offices, stores, houses, and other buildings in the gold-mining communities across the

Dominion. Most of the progress can be traced however to the expansion of industry in general, the pulp and paper, chemical, and other manufacturing industries, the transportation industries, and the construction industries. It can be traced in part also to the policy of making the maximum use of domestic raw materials, one of several instances of this being the much greater use in recent years than formerly of Canadian limestones for building purposes.

Thus, by the commencement of the present war, mining in Canada had attained an importance far beyond the expectations of a generation ago. From a few scattered operations at the commencement of the century its activities have spread across the Dominion. Slow at first to realize its possibilities Canadians, by reason of the industry's rapid expansion, later began to regard it as one of the country's greatest assets. They were particularly impressed by the support it gave to the Canadian economy during the years of the world-wide depression when many industries were forced successively to curtail their operations.

That was in peace-time. Now the industry has a much greater task in providing its share of the mine products which Canada and the Allied countries must have to manufacture and operate the tools of war. This calls for increases in the outputs of almost every metal and mineral mined in the Dominion, the increases in some cases being greater by 300 per cent. than the corresponding peace-time figures. These increases are possible only because the domestic sources of supply are large. But they are not inexhaustible, and if not replenished by further discoveries, the industry cannot hope to duplicate, much less excel, the achievements of the past.

This is part of the cost of war, but it is not a problem that cannot be overcome, for there is no evidence, geological or otherwise, to suggest that the many large sections of Canada that have yet to be carefully prospected are largely barren of commercial deposits. There is ample evidence that this is not the case, and that the mineral possibilities even of the older areas have yet to be fully determined. The growth of the industry prior to the war was made possible largely because those responsible for it were men of foresight and initiative. They recognized the industry's possibilities and they based their programmes for development on these possibilities. Such a course of action in the future will assure for Canada the maintenance of the high place she now holds as a producer of metals and minerals.

THE LAST MILLION YEARS

THE LAST MILLION YEARS: a history of the Pleistocene in North America. By A. P. COLEMAN. Edited by G. F. KAY. *Toronto: Univ. of Toronto Press*, 1941 (*Oxford Univ. Press*). 9×6 *inches;* xii+216 *pages; illustrations and diagrams.* 16*s*

IN a foreword Professor E. S. Moore states that the manuscript of this book was nearly completed several years before Dr. Coleman's death in 1939, at the age of eighty-seven, but that it was laid aside until further information could be obtained regarding south and central North America and Mexico. Although Coleman was already over eighty years of age he spent the next five or six years of his life in climbing mountains in those regions in search of fresh information regarding their Pleistocene history. After his death the manuscript was edited by Dr. G. F. Kay, a well-known glaciologist and one of his former students, and the volume was published by the University of Toronto Press as a memorial to the author.

The difficulty of collecting and collating within a compass of some two hundred pages the work of a host of investigators must be evident to any one who has tried to follow the vast amount of research which has been done on the Pleistocene events and deposits of the North American continent. Since there have been acute differences of opinion among these workers on many questions it is inevitable that not all the conclusions at which Coleman arrives will be accepted by other glaciologists.

The picture which the author presents opens with a short account of the continent in the Pliocene period before the onset of glaciation, and he accepts the view of, among others, Spencer, that the continent stood at a much higher elevation than at the present time. It may be pointed out that Spencer was led to this conclusion by a study of the first of the now well-known submarine canyons of the North American coast, namely that opposite the mouth of the Hudson which he attributed to river erosion during a period when the land stood at least 2000 feet higher above sea-level. The discoveries made more recently that these canyons descend to much greater depths than 2000 feet has made the acceptance of them as features of subaerial erosion much more difficult than in Spencer's day.

The glacial sections in the Mississippi valley are taken as the standard for North America; they prove that this region was visited several times by ice sheets radiating from centres in north central Canada (Keewatin centre) and from Labrador. Each sheet on its withdrawal left behind a layer of varying thickness of a clay deposit known as till. In the intervals between these visitations so-called interglacial deposits were laid down consisting in general of sands, gravels, and clays, but at one or more periods extensive sheets of loess were deposited. The fauna and flora of these interglacial beds are believed to indicate a climate considerably warmer than that which is assumed to have prevailed during the glacial stages. The high antiquity of the earlier of these interglacial deposits is suggested by the fact that most of the animal remains and many of the plants found in them belong to species which have since become extinct or no longer live in that part of North America.

It is still a subject of argument whether the Pleistocene deposits of Iowa and neighbouring states denote four or five glacial stages. The general tendency of recent investigations and discussions is to reduce the former five divisions to four, namely Nebraskan, Kansan, Illinoian, and Wisconsin, though this last stage appears to include some minor fluctuations one of which—the Iowan—is

now regarded as the earliest part of the stage. The main interglacial periods are named Aftonian, Yarmouth, and Sangamon, several minor ones being associated with the Iowan and other sub-stages of the Wisconsin.

The southern limit of the Nebraskan Ice Sheet was not far from St. Louis in latitude 38°. The sheet had its origin in the Keewatin centre; it is overlain either by the Kansan till or by the Aftonian. Where the two tills are in contact a large interval of time between the two glaciations is indicated by the great depth to which weathering has affected the top of the Nebraskan. The product of this prolonged weathering is called gumbotil. The land and fresh-water shells in the Aftonian and most of the plants found in occasional peat beds are of species still living in Iowa, but more than three-quarters of the mammals, which included elephants, camels, ground sloths, as well as deer, bisons, and beavers are extinct.

The Kansan Sheet is of wide extent and is in the main of Keewatin origin, though some ice from the Labrador centre reached southern Illinois during this period. It is deeply weathered into gumbotil which in places reaches a thickness of 12 feet. The succeeding Yarmouth also contains plants, land and fresh-water shells, all of them of species living in Iowa to-day.

The Illinoian till marks the incoming in force of ice from the Labrador centre which carried boulders from southern Ontario and Quebec into Kentucky, Iowa, and Missouri. It reached even farther south (latitude 37½°) in the Mississippi valley than the earlier sheets and is believed to have covered almost the whole of the north-eastern part of North America reaching on the south-east into New Jersey and Long Island. Surface weathering into gumbotil is not so pronounced as in the earlier sheets.

The Sangamon stage and other interglacial deposits associated with the earliest Wisconsin (Iowan) glaciation are somewhat varied. They include in places beds of peat up to 20 feet in thickness which have yielded some plants and a large number of beetles all of extinct species. In association with the Iowan phase there is a considerable development of loess in which remains of mammoth, mastodon, musk-ox, and buffalo have been found. The few plants and animals are said to suggest a moist cool climate unlike that of the present States of Iowa and Illinois.

The last or Wisconsin drift is the least weathered; boulders of igneous rocks, limestones and other sedimentary rocks are usually quite fresh and often beautifully polished and striated. Its upper surface retains a characteristic kame-like topography near the margin of the sheet with eskers and drumlins, while beyond its edge is an extensive outwash plain of sands and gravels. The sheet is a combined product of ice radiating from both the Keewatin and Labrador centres. Within the boundaries of the sheet a driftless area 200 miles long and 100 miles wide has been recognized west of Lake Michigan.

It will be seen from Coleman's account of these glaciations that the main feature of the earlier till sheets is the depth of weathering of the surface of each sheet to gumbotil. This zone of weathering not only indicates the lapse of a considerable time between each sheet but also allows the subdivision of a section including two or more till sheets either with or without interglacial beds.

The next region which Coleman describes is that of the lower lakes around Lake Erie and Lake Ontario; this is naturally the area with which he was most familiar and in the investigation of which he took a prominent part. Unfortunately the features which distinguish one till sheet from another in the Mississippi valley are not found in the region of these lakes. Several sheets of till have however been recognized either by the presence of intervening bedded deposits which are interpreted as interglacial or by boulder pavements. The

latter are believed to prove that an earlier till has been eroded and weathered leaving a concentration of boulders which have subsequently been over-ridden by a later ice. The boulders were in consequence flattened and striated; the lower till is also in general much harder than the overlying till sheet, and may be of different colour. Beyond the fact that these appearances probably prove that ice visited the same places more than once they afford no satisfactory index of the time interval between the two sheets nor do they make it possible to correlate any one till sheet with those in the Mississippi valley region. In places too a lower till sheet has been dissected by streams and the valleys have been subsequently filled by a later till. Since some of these valleys are wider and more mature in aspect than those cut in post-glacial times the interval which elapsed between the two sheets is presumed to have been considerable.

The early history of the Erie region is imperfectly known in comparison with its late glacial history. It is known that the rock floor is deeply buried and the fill below the Wisconsin sheet is believed to include more than one sheet of till with interglacial deposits containing land and fresh-water shells as well as plant and insect remains. On the shore of Lake Cayuga they yielded a lacustrine fauna; all the species now live in the lake itself, but some of the Unionidae are Mississippi forms.

The sections around Lake Ontario, notably in the Scarboro Heights and in the neighbourhood of Toronto, are among the best known and best displayed of the Pleistocene deposits of North America. There are two sets of fossiliferous interglacial deposits which are included between the same two till sheets. These are the Don beds exposed in brickyards in the Don valley and the Scarboro beds displayed in vertical cliffs on the north shore of Lake Ontario. The Don valley brickyard beds, which are considered to be beneath the Scarboro beds, have at the base about 4 feet of till resting on an uneven and unstriated surface of Ordovician Shales. The boulder content of the till proves the Labrador origin of the sheet.

At the base of the overlying Don interglacial deposits is a blue clay which has furnished an abundant fauna of shellfish and many remains of trees and smaller plants; of thirty-eight species of trees three are said to be extinct and together the flora is considered to imply a climate like that of Ohio and Pennsylvania, or 4–5 degrees warmer than that of Toronto at the present day. The shellfish include many Mississippi unios.

The Scarboro beds are clays nearly 90 feet thick with peaty or silty layers overlain by over 50 feet of sands. The surface of the lake in which they were laid down stood some 150 feet higher than that of Lake Ontario; its outlet is not known, but it may have drained eastward into the St. Lawrence, and if so the Niagara Falls of those days would be more than half drowned. The Scarboro shells include some Mississippi unios and a few other shells; the plants grow at the present time farther south and the insects, mainly beetles, are considered to represent conditions similar to those of the present day, though it would appear that most of the species are extinct. A lowering of the lake outlet by 165 feet caused deep erosion of the delta-formed Scarboro beds, and in the Sun brickyard in the Don valley sand and gravel were laid down in one of the eroded valleys. The shells and trees including red cedar, oak, elm, and paw-paw are said to prove that the climate was warm.

These interglacial beds have been compared by various authors with the Yarmouth, the Sangamon, and the Aftonian of the Mississippi valley; Coleman appears to favour a correlation with the Yarmouth stage. Beyond the fact that a certain number of species is extinct there is however no firm basis for a correlation with any one of those stages.

The next events led to the formation of an alternating series of thin sheets of till with much thicker beds of varied clays. The tills are attributed to a readvance of the ice which however caused little disturbance of the underlying soft deposits. The till occupies an extensive area covering ridges and filling valleys eroded in the dissected lake or delta deposits. Finally the last or Wisconsin sheet deposited a brownish clay over the whole region; its surface is gently rolling, and it has been suggested that it is a waterlaid moraine formed in a lake standing at a higher level than any preceding lake.

One may be permitted to doubt how far this succession of thin tills and varve clays which succeed the Don and Scarboro beds can be said to represent a series of separate glaciations. The general conditions seem to have remained fairly similar throughout the period of their formation and did not greatly change at the time of deposition of the Wisconsin sheet, and in fact all the deposits may have been laid down in water. It appears that Coleman may have laid too much emphasis on the evidence of great climatic changes revealed by a succession of thin tills and waterlaid deposits. The sections themselves give an impression of relative continuity and do not appear to bear out the suggestion of a vast period of time such as one hundred and fifty thousand to two hundred thousand years made by Coleman.

The Toronto interglacial beds are compared with the Yarmouth stage; the upper tills are considered to represent the Illinoian and Wisconsin and the lowest the Kansan or perhaps the Nebraskan, though it does not seem to be much weathered and thus differs greatly from either of those sheets in the type area.

The story is continued in the St. Lawrence valley where shell-bearing marine sands have long been known far from the sea and hundreds of feet above its level. These were formerly considered to represent a post-glacial phase and a proof that the sea on the retreat of the ice covered wide areas on each side of the St. Lawrence valley extending northward to Ottawa or beyond and southward into the Champlain valley (Champlain Sea). Coleman brings forward a good deal of evidence that two distinct sets of marine deposits have been confused, one later than the Wisconsin ice-sheet and the other underlying a till, presumed to be Wisconsin.

Of the shelly fauna near Green's Creek on the Ottawa river many of the species are extinct and are therefore considered to be older than the post-glacial marine beds.

Near Ottawa shells are found 510 feet above sea-level and a vague old shore line nearby stands at 690 feet. At Montreal terraces of marine deposits are a well-known feature on Mount Royal and in adjoining areas. Shell-bearing sands occur up to 560 feet and contain some extinct species. Until these different deposits have been correctly distinguished the various phases of the glacial and post-glacial history of the St. Lawrence valley must remain uncertain. Coleman considers that during the submergence the gulf of St. Lawrence would be much wider than to-day and that probably much more ice came in through the widened straits of Belle Isle together with much cold water from the Labrador coast. He considers that it was some such conditions which allowed an arctic shellfish like *Portlandia arctica* to thrive 1000 miles inland from the coast. One is however reminded of the uncertainty of fossil species as indices of climate during the Pleistocene by the further statement that the sugar maple, the yellow birch, and the poplar grew there just as they do to-day.

Coleman is much less happy in his conclusions regarding the eastern region bordering on the Atlantic coast and Labrador. He asserts from his own rather brief investigations in difficult country that the Wisconsin glaciation was of

small account in these mountain and tableland areas and relied on statements that many relic plants had survived in several areas which could not therefore have been heavily glaciated. The Editor in a footnote (p. 121) states that many Pleistocene geologists who have worked in these regions do not accept these conclusions and believe "that the evidences for extensive continental Wisconsin glaciation are much more significant than they have been interpreted to be by the author. . . . Moreover, much less confidence seems to be placed now than formerly in the presence or absence of relic plants in interpreting the glacial histories of regions."

It would take up too much space to follow the author into the details of all the remaining glaciated regions of North America which have been less exhaustively examined than the more accessible areas. These deal with the region round Hudson Bay and the Great Plains to the west, the Cordilleran Region, and the far north and north-west of Canada and Alaska.

The account of the retreat of the last ice-sheets, the formation of the succession of great lakes around the ice margin follows in general the story worked out by Leverett and Taylor, though Coleman himself is responsible for a good deal of the work on Lake Iroquois, the precursor of Lake Ontario. Owing to the situation of these lakes in relation to the main drainage lines of the continent one or more of them drained into the Gulf of Mexico by way of the Mississippi or into the Atlantic through the Hudson valley or by the St. Lawrence farther north. It happened more than once that some of these lakes drained by two outlets at one and the same time.

The book, which is written in an easy style, reflects Coleman's keen interest in natural history in its widest sense. The reader will find in the bibliographies attached to each chapter good guides to the publications which contain much of the story of the Pleistocene of North America which is related in this volume.

O. T. JONES

TRAVELS IN THE YEMEN SEVENTY YEARS AGO

TRAVELS IN YEMEN: an account of Joseph Halévy's journey to Najran in the year 1870 written in San'ani Arabic by his Guide HAYYIM HABSHUSH. Edited with a detailed summary in English and a glossary of vernacular words by S. D. GOITEIN. *Jerusalem: Hebrew University Press*, 1941. 9¼×6 *inches;* vi+102 *pages* (*in English*); v+138 *pages* (*Arabic text in Hebrew characters*)

A DEBT is owing to the editor of this remarkable work. Halévy wrote no book on the journey during which he recorded six hundred and eighty-five Sabaean inscriptions (thereby increasing more than six-fold the number known) and covered country previously untouched, much of it still untrodden, by Europeans. His work in the *Journal Asiatique* (Paris, vol. 19, 1872) contained only a short account of the whole journey and publication of the inscriptions; his later article in the *Bulletin de la Société de Géographie* (Paris, vol. 6, 1873, and vol. 13, 1877), though fuller, breaks off with his arrival at Wadi Najran. But his Yemeni Jewish guide Hayyim Habshush, at the instigation of the later explorer, Dr. E. Glaser, compiled a manuscript narrative of the whole journey in 1893–4. Glaser refers in one of his books to Habshush's manuscript. But Habshush's story has never been published till now, when it appears almost complete, thanks to its editor, who has pieced together several copies, stored at Jerusalem, at Vienna, and by the Chief Rabbi of the Jews at San'a.

Habshush, a coppersmith whose interest in inscriptions may have been first aroused by his acquiring Sabaean bronze tablets simply as metal for his work, and who, like many Yemenis, used Sabaean letters for magic without knowing their meaning, was a grown man in 1858. After his journey with Halévy he was employed by Glaser and other later travellers to copy inscriptions and to collect old books. He died in the winter 1899–1900. Beginning to write late in life, twenty-three years after his journey with Halévy, he displayed wonderful powers of memory. Like some other oriental helpers of European travellers, he could recall places, people, and incidents in great detail. Some of the places visited with Halévy he had, indeed, revisited in the meantime, and he recorded additional facts, even geographical and archaeological details, omitted by Halévy. His service with the latter opened his eyes. He was interested in almost every aspect of the country. He characterized persons and groups with much insight. Though a townsman, he comprehended the pride, bravery, and frugality of the rough tribesmen. This insight into character was extended even to his employer and himself; for he frankly contrasts his own timidity and relative inability to endure hardship with Halévy's courage and frugality. While expressing immense admiration for Halévy, Habshush relates various tricks which he played on his master. In spite of realizing to some extent the attitude of mind of nineteenth-century Europe, Habshush always remains "a religious, shrewd and witty man of San'a"; herein, says the editor, lies the peculiar charm of the book.

Those who, like the present writer, cannot read Habshush's story in the original, will be peculiarly indebted to the editor for the Introduction and full annotated Synopsis in English. For, following the practice of Arabic-speaking Jews for a thousand years, Habshush wrote in Arabic but used Hebrew characters. Thus is his text reproduced. He had in mind to compile a history of the Jews in the Yemen, a fragment of which exists in manuscript. His editor explains that, while Habshush wrote in the San'ani dialect, he used a semi-literary vernacular with a long-standing tradition. His writing is thus much in

advance of another work of the same type, the account left by a San'ani Arab, Ahmed al Jaradi, of the last journey of the German Jewish traveller Hermann Burchardt. It may be recalled that Burchardt, together with the Italian Consul at Mocha, was murdered by bandits in Southern Yemen, not far from Ibb, in December 1909. Very soon afterwards, Burchardt's Secretary, Al Jaradi, wrote the story of the journey. This was published in 1926, with a German translation, in E. Mittwoch's 'Aus dem Jemen.' Al Jaradi (who naturally wrote in Arabic characters) resembled Habshush in not writing literary Arabic; but whereas Habshush's writing is of the traditional semi-literary kind, Al Jaradi's language and spelling are crude and erratic. He was a man of simpler mind, who recorded indeed exact particulars, plainly as taught by Burchardt, but without originality.

The English Synopsis (pp. 15–71) comprises so many points of interest that it is possible to indicate only a few. It may be noted that Habshush and not Halévy copied most of the inscriptions. Many of them were in places where Halévy had to lie hidden in such accommodation as could be found, where he could not openly have conducted archaeological investigations, not even in his guise of a rabbi from Jerusalem collecting alms for the poor of the Holy City; for his journey was a hazardous undertaking even in a day of adventurous journeys. What is perhaps still more important, Habshush appears to have induced Halévy to take the north-easterly route from San'a through the land of Nihm to Al Jauf and thence to Najran, whence they returned to Jauf, then travelled to Marib, and thence back to San'a. Halévy had intended to go direct to Marib by the more easterly route followed by earlier travellers.

Secondly, Halévy's journey took place in 1870, when the Yemen had been left to itself since the end of the first Turkish dominion about 1630. In 1872 the Turks re-conquered the highlands. Though they have since withdrawn again, their second occupation and later events have rendered the country slightly less difficult of access, though it is still a closed land except with the express permission of its ruler. But the almost complete isolation of the times before 1872 is gone. Hence Habshush's sidelights on local politics and the life of Arabs and Jews have a historical value.

From his general account of the situation we learn that the Imam Muhsin ash Shahāri lived south of San'a, without real power, while the capital was governed for him by the father of the present Imam, Seiyid Muhammad ibn Yahya, who later became Imam. Drought and pestilence had reduced the population of San'a, and the country was in an anarchic state. Halévy arrived in San'a without money or baggage. His gear was left behind at Saf'an in Harāz (near the mountain road from Hodeida to Manakha), because the Imam had attacked the Da'i of the Isma'ilis in that district, and later because of a war waged by the Arhab tribe. The Zeidis, of whom the Imam is head, and the Isma'ilis are both offshoots of the Shi'a Muslims; since the Isma'ilis dwell in isolated groups in the Yemen, they were liable to attack by the more powerful Zeidi sect centred about San'a.

While Halévy was detained by illness in San'a, Habshush went alone to Gheiman, some miles south-east, where, despite difficulties arising from the suspicions of the people, he copied many inscriptions and excavated part of the pre-Islamic city-wall. When at length Halévy and Habshush set out on their journey, the whole Jewish community, not excepting the Chief Rabbi, who alone understood the archaeological objects in view, thought the real purpose was to search for the lost Ten Tribes. Habshush enthusiastically hoped to find the warlike tribe of Dan.

One distinction between the dress of Jews and Arabs in the towns and villages of the Yemen is that the Jews are unarmed and, carrying no *jambiya* (dagger),

wear no girdle. How strange, then, to read of wild Jewish men with the typical long side-curls of Jews, but with silver-inlaid swords, which differed in shape from the daggers worn by the local Arab tribesmen. This was far from San'a, in the oasis of Khabb, between Jauf and Najran. Later, Habshush writes of a Jew dressed and armed entirely like a Badawi Seiyid, which was said to be not uncommon in those remote regions. A local Jewish guide employed on part of the journey to Jauf astonished Habshush by cutting bundles of lucerne and eating them raw, having nothing else for supper. A Badawi woman was seen eating raw meat, some of which she offered to Habshush. This habit is so much associated with Ethiopia that its occurrence in parts of South Arabia, and of the Lebanon, may be forgotten.

Habshush several times stresses the wonderful dressing of the masonry in the pre-Islamic buildings. At the ruined town of Baragish, which he observes must have been rebuilt three times, the oldest buildings were the most beautiful. Their stones were so perfectly dressed that a whole wall appeared as a single stone, and the joints were without mortar. The doors and windows of Sabaean buildings are smaller than those of modern buildings, so he concludes that the popular belief in their having been erected by giants must be false. In Banat 'Ad ("the daughters of 'Ad," a place presumably attributed to the 'Adites, people of gigantic stature [1] believed in South Arabia to have inhabited the land after the Flood) one could not enter the outer doorway without bending the head; but the second, farther in, is larger, and the third, leading into the room locally called Makrab Banat 'Ad, is the largest, its lintel and side-posts being hewn out of one stone. In Baragish, too, a subterranean room with columns and with an ornamented monolithic doorway was discovered. Many of these and other details were not published by Halévy. Later in the journey, between Jauf and Marib, Habshush noted the remains of an aqueduct of hewn stones, not mentioned by Halévy. In Wadi Majzar, on the outward journey from San'a to Jauf, Habshush noted a double row of circular Sabaean tombs, agreeing fully with Philby's account of these structures in the great desert necropolises at Ruwaik, 'Alam Abyadh, and 'Alam Aswad, far to the east. Halévy also described innumerable strange stone constructions in the Wadi "Medjzer" (Majzar) and his puzzlement as to their nature, until he found human bones near one of them. Halévy's description is not very clear, and might be taken to mean that the tombs were rectangular: "leur forme etait presque carrée"—unless this sentence refers to the "plaques de schiste" of which the tombs were built. He writes that his "conductor," that is Habshush, called the tombs 'Adiyat, or buildings of the people of 'Ad, and said that the latter were identical with the Beni Hilal, "sons of the New Moon," who formerly dwelt in Jauf, and left ruins of vast dimensions (*B.S.G., Paris*, 6 (1873) 272).

As to Wadi Najran, since so graphically described by Philby, Habshush wrote that it took two days to traverse its length, and half a day to cross its width; that it is very fertile, with very sweet waters less than 20 feet below the surface; its palm groves so dense that the sun cannot be seen through them; excellent wheat; figs and grapes also cultivated, though gathered before they are

[1] I do not know how widespread is the tradition of ancient races of giants, to explain the existence of masonry of huge size. But the descendants of 'Ad can scarcely fail to recall the Nephilim (giants) of *Genesis* (chap. 6, verses 1–4), reputed to have inhabited the earth before the Flood, and the ideas there given as to their lineage; or the repeated allusions in the Pentateuch to Rephaim and Sons of Anak, giants believed by the Biblical writers to have dwelt in Canaan and adjacent lands in ancient times (*e.g. Numbers*, chap. 13, verse 33; *Deuteronomy*, chap. 2, verses 10, 11, 19, 20).

ripe. None might own land there but the tribesmen of Yam, not even the Sharifs, descendants of the Prophet, who visited the district yearly at date harvest.

Visitors to the towns and villages of the South-West Arabian highlands find most metalwork, especially fine craftsmanship in silver, in the hands of the Jews. But between Jauf and Marib, Halévy and Habshush met a Badawi silversmith who had not even the art of melting metals. On the return journey from Najran to Jauf they lodged with another silversmith, apparently a Muslim, whose very old mother, not one of his several wives, ruled the household. In Marib, too, they met a San'ani man who used to dig (at Marib) for gold and silver; and Habshush noted that tribesmen brought fragments of Sabaean gold and silver to San'a for sale.

This review may be closed with a few remarks on matters connected with natural history. The first is negative: Habshush's story apparently contains no reference to the occurrence in Jauf of large beasts, lion, giraffe, and rhinoceros, all of which have been reported much more recently to live there; his story therefore confirms the belief that these reports are erroneous. The lion may have existed in the district in historic times, but it seems doubtful if the other animals did.

Between Najran and Jauf the travellers saw a large and very poisonous snake called *hayyah*. This may well have been a puff-adder; for though I understand the term *hayyah* to be more or less general, yet in the Amiri highlands of the Aden Protectorate my colleague (E. B. Britton) and I found *hayyah* to be restricted, both by our local escort and our Somali servants, to the puff-adder. *Hayyah* was not included under *hanash* by these men at least; the latter word was used for snakes of more slender form.[1]

Habshush records that near Raudha (a little north of San'a) a local Jew, interested in alchemy, treated the bite of a snake by cutting away the surrounding flesh, washing the wound in hot water, and binding it round with garlic and a plant called *'ubab*. The patient recovered, and was therefore not taken to the famous Bait as Sirhi family, who heal snakebite with semi-precious stones, the uses of which are explained by Habshush in detail. The plant *'ubab* is identified as *Withania somnifera* (Order Solanaceae); this is doubtless correct for the district under review, but in 'The Land of Uz' (p. 313) Wyman Bury applied nearly the same name, *'ubub*, to the swollen-stemmed, pink-blossomed *Adenium obesum* (Order Apocynaceae), the *'adan*-tree. Wyman Bury may have been mistaken, but the same name may be used for quite distinct plants in different districts.

Lastly, Habshush recorded that the large fish (barbels) in the river Kharid, north-east of San'a, were narcotized with the black seed of a wild plant called *dhafar*, and thus caught and taken to market at San'a, where they are still sold. This plant was not identified, but, through some specimens labelled "*dhafar*" collected by Philby, I can say that it is a low-growing leguminose bush of the genus *Tephrosia*, several species of which are used as fish-poison in Tropical Africa and Tropical America.

HUGH SCOTT

[1] Hugh Scott, 'In the High Yemen,' see postscript note, p. 238 (in the press, 1942).

REVIEWS

EUROPE

THE PLACE-NAMES OF WEST LOTHIAN. By ANGUS MACDONALD. *Edinburgh: Oliver and Boyd*, 1941. 9×5½ *inches;* xl+180 *pages; maps.* 15*s*

The reviewer of a book of place-names might well be forgiven for comment on the lines of the reader of a dictionary, who found it full of interest but weak as to plot, but on second thoughts there is quite a lot of plot in the plan of place-names. The interpretation and derivation of place-names exercise a fascination for very many people, and Scottish ones, drawn from British, Gaelic, Pictish, English, Scandinavian, and French sources, present an unusually rich field for diligent work as is clearly seen in 'The Place-names of West Lothian' just published, the first treatment of a Scottish county's place-names, to be carried out on the very thorough and generally accepted lines of the English Place-name Society. The author, Dr. Angus Macdonald, lecturer in English at King's College, Newcastle-upon-Tyne, has produced a valuable volume which might well serve as a pattern for others in a series covering the counties of Scotland. The general introduction briefly but adequately explains the scantiness of the early records, and the difficulties arising therefrom which are complicated by the linguistic background. In the historical introduction, it would have been an advantage to have had a more detailed description of the topography of the area and its variation with the passage of time, followed by an outline of its history exclusive of that relying upon place-name evidence, before passing on to the conclusions of the author and others based on the material which forms the major part of the book. The place-names are arranged topographically, parish by parish, and are divided into two groups, one in which the names are of primary historical or etymological interest and a second including those of topographical origin and incorporating family names. Each entry is well documented and its development shown chronologically, together with variants. Where alternative derivations are possible, authorities and interpretations are given succinctly. The author has broken fresh ground in his inclusion of surveys of street and other minor names of Linlithgow itself, and again of field names. The chapter on the elements found in West Lothian place-names rounds off an excellent piece of work, though it is to be regretted that the map showing distribution of language types was not contoured to suggest what association there may be between topography and settlement. The book, which is well indexed, is indeed a mine of information and it also reveals clearly the pitfalls that lie in the way of those who light-heartedly essay the explanation of present-day place-names, without regard to the mutations of time and mutilations of ignorance. D. A. A.

TUDOR CORNWALL: Portrait of a society. By A. L. ROWSE. *London: Jonathan Cape*, 1941. 9×6 *inches;* 462 *pages; illustrations and maps.* 18*s*

Intending to write the story of the Reformation in Cornwall and its repercussions on local society, Mr. Rowse was led so far afield that he was able to present a complete portrait of Tudor Cornwall. The result is a richly satisfying book. It was during the Tudor period that Cornwall, hitherto remote, poorly developed, an insignificant fragment of the "Celtic fringe," became absorbed into the main current of English life. That current had begun to set westwards with the opening of the Atlantic and the discovery of America; nowhere was the consequent change of geographical values more striking than in the south-west.

True that Cornwall had, throughout medieval times, maintained its traditional links with Brittany and Wales; it had for centuries provided a most valuable English staple, namely tin, but its population of fisherfolk and miners had been poor and obscure, vast stretches of the countryside were wild and unproductive, given over at best to the summering of cattle, while but a single highway led through the county, from Launceston by Bodmin and Truro to Helston and thence to Sennan Cove. How all this changed so that the native Cornish speech itself became a thing of the past, notwithstanding that Cornishmen resisted change and staged their pitiful rebellions, is told with a wealth of documentary evidence, much of it quite new, by Mr. Rowse, who is himself of Cornish descent.

Of particular interest to geographers is the full account of the land, how it was held, and how employed, an account drawn not only from the vivid pages of Richard Carew, but from numberless manorial surveys and manorial court rolls. Industry, trade, and shipping are also discussed, for all underwent change: mining technique developed, trade found new channels, shipping multiplied. To take but one example: Fowey was the ancient focus of internal Cornish trade with Ireland, Wales, and Brittany. Falmouth soon outstripped it when foreign trade expanded and Cornwall became an intermediary for southern England as a whole. The full-length discussion of the Dissolution of the Monasteries, house by house, again presses home the inevitability of change. Not any faults or misdoings of their inmates, but the fact that, through the spread of lay education, they no longer held the keys of knowledge, brought about the decay of the religious houses. They had been vigorous organizations, social and economic, as well as religious leaders. But they ceased to be necessary, and like the feudal castles they were swept away.

Students of early topography will delight in the full portrait of Richard Carew of Antony, and in the glimpses of the contemporary diaries of William Carnsew and his sons. For the daily doings of lesser folk the court records have been searched, since in Elizabethan law suits the very words of accused and accuser were transcribed. The four sketch-maps, although useful enough, are somewhat wasteful of paper for what they contain, while the lack of a complete bibliography will be seriously felt by the student of the period for whom 'Tudor Cornwall' will be an important source book. A page is set aside for abbreviations —it contains but eight entries where dozens are required. This is a book which neither scholar nor layman should miss. E. G. R. T.

AFRICA

FOCUS ON AFRICA. By Richard Upjohn Light. American Geographical Publication. Special Publication No. 25. *New York: George Grady Press*, 1941. 7½×10 *inches;* xv+228 *pages; illustrations and sketch-maps.* $5

This book, written by an American physician, is an account of a trip, lasting about two months, taken in the author's plane from the Cape through Africa and across the Mediterranean to Corsica. Dr. Light's style is chatty and interesting, and the book contains a chapter on "The scope of aircraft in Africa," which will be of use to the novice.

The truly excellent photographs, three hundred and twenty-three in number, almost all taken by Mrs. Light, have in many cases a distinct scientific value; for instance the results of the rapid erosion which is causing such havoc throughout the land is well illustrated in Nos. 163 and 248 and the important contributory factor of grass fires in Nos. 312 and 313. Of special geological interest are the photographs of the Rhodesian "Great Dyke" (88), of the fault scarp of the Livingstone Rift Valley (134, 138), and the canyon of the Swam (Turkwel)

river (193). No. 179, showing the eastern approach to the Ngorongoro crater, should do much to dispel Bailey Willis's statement that this mighty caldera is "merely a part of the East African rift trough." Of general interest are the photographs of the Kibo summit of Kilima Njaro and the excellent panoramas of the other snow mountains, Kenya and Ruwenzori.

It is interesting to note in passing the author's views as to the result of the present war on the future of the native peoples. In his introduction he concludes the *bouleversement* produced at home "is perhaps of but small importance to the African continent itself," on the grounds that "In the end it little matters whether one nation of the white man's Europe or another" assumes possession; apparently implying a uniform degree of charity and understanding on the part of the incomer. If the author, who is an apt observer, had lived in Kenya and Tanganyika during and after the release of the latter from the German yoke, he would have realized the dreadful misery that results should these gentler virtues be lacking. The outcome of this war is, surely, vital to the happiness of the native of Africa. It should be added that the book is usefully illustrated by sketch-maps of the route taken, and contains a bibliography of sufficient scope to be of real value to the interested reader who desires to continue study of any of the subjects touched on. J. P.

In view of the high standard of the photographs we have submitted the book to two Canadian Air Surveyors for comment:

The photographs are of exceptionally high calibre, and it is a tribute to the clearness of African air and to the dryness of the climate that photographs taken on nearly every day for the whole trip should be so generally clear and free from haze. Illustrations of volcanoes, faults, and of the "Great Dyke" of Southern Rhodesia will make any geologist wish for more, although, generally speaking, there is a disappointing lack of geological information to one accustomed to photographs of that other great area of pre-Cambrian rocks, the Canadian Shield. This must be attributed to depth of weathering and absence of continental glaciation. J. T. W.

The photographs offer a remarkable air appreciation of Africa. It is no amateur collection, propped up by the universal appeal of the subject, but the enviable accomplishment of a skilled photographer. There is no better test of an air photograph than half-tone reproduction. The crispness and brilliancy of these is a tribute to the quality of the original negatives, as well as to the engravers.

It is regrettable that, as yet, stereoscopic observation of photographs in three dimensions does not conveniently lend itself to circulation of air views in book form. However, skilful and painstaking use of shadow, by judicious timing of the flights to have the sun in proper relation to the ground, has in practically all these photographs given a strong and comprehensive expression of topography by shadow relief, which goes a long way to make up for the stereoscope.

Much can be said for and against ground travel versus air travel. The author asks "Does an airplane journey across a territory entitle the traveller to claim that he has 'been there'?" The ground traveller who has penetrated the hard way merits a strong claim against the ephemeral air visitor. Yet the airman achieves an understanding and a feeling for the region never to be gained on the ground. The laity are not likely to appreciate either the hazards and difficulties that must be met in the traverse by air; the delicate equilibrium with ground cooperation that must be maintained; the menace of incomplete or faulty maps; the ever uncertain fuel-time equation, with its often indeterminate coefficients of head winds, zero visibility, and "riding the motor." One thing is

certain, there are few joys comparable with that of flying over country through which, at some previous time, you have travelled the "hard way." G. S. A.

CHERRY KEARTON'S TRAVELS. By CHERRY KEARTON. *London: Robert Hale*, 1941. 8½×5½ *inches; 286 pages; illustrations.* 12*s* 6*d*

It is reasonable to expect a book with such a title by this well-known traveller to contain new material of unusual interest. Unfortunately this is not the case. The train and road journeys from Mombasa to Nairobi, Nyeri, Lakes Naivasha and Nakuru, the Murchison Falls, fascinating as they are, are subjects of little novelty in these days of easy travel. Descriptions of such frequented, one might almost say tourist-ridden spots, have been often done before. Even the two chapters on protective coloration and nestbuilding by birds and insects are usually, in major points at least, familiar to those interested in natural history. The book contains a portrait of the author and the photographs, forty-five in number, are, it goes without saying, excellent. Neither index nor map is provided. J. P.

NORTH AMERICA

THE HAITIAN PEOPLE. By JAMES G. LEYBURN. *New Haven: Yale University Press* (*London: H. Milford*), 1941. 9½×6 *inches;* x+342 *pages; end-paper sketch-maps.* $4.00 (24*s*)

To the social historian, the republic of Haiti presents numerous interesting aspects for research. Professor Leyburn, on the basis of his own studies and those of recent Haitian scholars, has written a comprehensive account, with moderation and discretion. His insistence on regarding the problems encountered from the point of view of the peoples concerned, and his critical judgment combine to produce a balanced account. He also provides sufficient historical detail to explain developments in social organization, religion, language, and economics. The bulk of the population are the two or three millions descended from the transported African slaves; gaining with difficulty a living from their small plots, they are isolated from practically all contact with town life or the outside world, uneducated, and governed by religious practices and beliefs derived originally from their West African ancestors, but with large additions from Roman Catholicism and modified by local developments. They were the foundation of the revolt against French rule and slavery, placing at first authority in the hands of black dictators. Distinct from them, so markedly as to constitute a caste, are the *élite*, the product of French and "affranchi" blood; exclusively town dwellers, despising manual work, they have appropriated the professions and the administrative posts, and their whole outlook is ultimately French rather than African. Professor Leyburn explains clearly the reasons for this cleavage, the social contrasts arising out of it, and the obstacles to its removal. The Haitian peasants rejected plantation life with unanimity, preferring to be their own masters at the price of a low standard of living; thus the country is economically backward, and funds are not available to fit the masses through education to share in their own government or to develop an economically sound middle class. Since the *élite* alone are educated they retain control in their own hands, though aware of unsatisfactory features in their position. Over-population, disease, and lack of education are shown to be the pressing problems of modern Haiti, and unfortunately there appears no practical method of tackling these successfully so long as the State's revenues remain near their present level and the governing caste rejects scientific work for political advancement. The introduction of foreign capital which might provide a solution, would no doubt bring with it further problems. G. R. C.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

VOLES, MICE AND LEMMINGS: problems in population dynamics. By CHARLES ELTON. *Oxford: Clarendon Press*, 1942. 9½×6 *inches;* iv+496 *pages; frontispiece and diagrams.* 30*s*

Mr. Charles Elton has devoted the last sixteen years to the study of the fluctuations of animal populations, their history and their causes and has founded a special organization to carry out these researches, the Bureau of Animal Population at Oxford, under the auspices and with the financial help of the University and other bodies. In the present volume he gives a very complete account of these remarkable phenomena based on very thorough study of the literature bearing on the subject and the results of his own research and those of the Bureau.

One of the best-known examples of fluctuations in the numbers of small mouse-like mammals is that of the lemmings, the story of which is familiar to most of us. In Norway these brightly coloured little voles normally live in the subalpine zone between the birch forest and the true alpine region in the grasses and sedges. About every third or fourth year there is an enormous increase of the numbers and a consequent emigration down the slopes of the mountains through the forest belt and the low country till the sea is reached, where many perish in the water though some manage to reach outlying islands. During this migration the lemmings do a good deal of damage to the meadows and grass crops and they are preyed on by many enemies. After the emigration they largely disappear until three or four years later on.

Somewhat similar fluctuation of field voles have been observed in most parts of Europe, Asia, and America, and Mr. Elton devotes several chapters to the vole plagues of southern Scotland, especially those of 1875–6 and 1891–2 and of later years into which the Bureau has made many elaborate investigations, but so far there seems to be no very definite conclusions reached as to the causes of these outbreaks and their disappearance.

The second half of the volume is devoted to wild life cycles in Labrador and Ungava, and is based almost wholly on information derived from the Hudson's Bay Company and the records of the Moravian Mission which run back for over a hundred years. Both these bodies trap and trade in fur more particularly that of the Red Fox to the south and the White Arctic Fox in the north, and the records show very clearly that the cycle runs in three- to four-year periods. Especially is this the case with the foxes, the good years, every third or fourth, showing a very noticeable increase in the number of skins obtained over those of the intermediate years.

Mr. Elton has assembled and discussed various explanations of this remarkable cycle and is inclined to believe that it is due to the lemming and vole cycles which afford an abundant food supply to the foxes and other predators—an unpleasant word used very often by the author—but the evidence for the fluctuation of the voles is not nearly so convincing as in the case of the foxes.

It is this matter of population fluctuation that is the main subject of this large volume, but incidentally it contains a vast amount of information in regard to the economic side of the question and the means of keeping the vole and other plagues in check by artificial means. There is also a great deal of natural history of the lemmings, voles, foxes, and the history of the fur trade. The text is perhaps a little rambling and might well have been better arranged so that the conclusions were more clearly stated.

Perhaps it might be pointed out that the name of Sir Walter Elliot, on p. 131, is wrongly spelled, and that he was hardly a retired colonial administrator but an eminent Madras civil servant, and that Mount Rainier (p. 110) is in the State

of Washington in the north-west corner of the United States and not in New York State. These perhaps are trivial mistakes, and we must thank Mr. Elton for a volume replete with information and for the discussion of a problem of natural history not only of great scientific interest but with important bearings on economic problems. W. L. S.

ECONOMIC AND HISTORICAL GEOGRAPHY

WORLD SHIPPING. By A. C. HARDY. (Penguin Special.) *Harmondsworth: Penguin Books*, 1941. 4×7 *inches; 224 pages; diagrams.* 9*d*

This book, with its most pleasing illustrations by Laurence Dunn, has a readable account of a difficult, but fascinating, topic. Chapter I is a rather slight introduction to the historical development of marine transport. The following chapter deals with the various specialized cargoes and with the vessels created to handle each commodity which has its own special problems of handling or stowage. This chapter is liberally provided with maps and illustrative sketches. A number of improvements occur to the geographically-minded reader as regards the maps. For example the Grain map (p. 27) needs a more accurate location of growing regions, as Canada, to take a most conspicuous error, does not grow wheat in the area of the Laurentian Shield indicated. Again with the Timber map (p. 35), a world map, with a tiny inset, gives no picture of the peace-time routes from Sweden and Finland; a map of northern Europe would be more appropriate.

Later chapters are concerned with trade routes over the oceans along great maritime canals, rivers, and across the Great Lakes. Illustrated by carefully related diagrams and by skilfully drawn ship profiles these chapters give an excellent view of the pre-war flow of traffic on the waterways of the world. Succeeding chapters analyse the relative values of coal and oil for propulsion. The book concludes with an account of modern ship design and a word on the probable effect of aircraft on future design.

This review must not omit a tribute to the publisher for producing such an inexpensive book under war conditions. A. C. O.

GENERAL

GYPSY AFLOAT. By ELLA MAILLART. *London: Heineman*, 1942. $8\frac{1}{2}\times5\frac{1}{2}$ *inches;* xiv+240 *pages; illustrations and end-paper sketch-maps.* 12*s* 6*d*

Readers of Mlle. Maillart's other books will be at the same time interested and a little disappointed in 'Gypsy afloat.' Interested to read of the years before her expeditions to Asia, disappointed because "The following pages are nothing more than a few memories." Certainly many of the memories are amusing and vivid, starting with her escape from teaching French at an English school to become a cabin boy on a barge; then sailing round the coasts of England, France, and Holland, hoping to reach the South Seas but always prevented by ill-luck. The English style is rather strange in parts, for this is the author's first book in English, but the general liveliness and readability show the wisdom of avoiding the dulling effect of translation. Much of the characterization is good, the Colonel, the owner of the barge *Volunteer*, and some of the French sailors in particular. The accounts of tunny fishing off the coasts of Brittany, an escape with a motor yacht from a French harbour, and the periods of fitting out the different vessels in shipyards are some of the best reading. This is a book which yachtsmen will enjoy, though there is little of interest for the geographer. D. R. C.

THE MONTHLY RECORD

MEDALS AND AWARDS 1942

His Majesty the King has approved the award of the Royal Medals as follows: the *Founder's Medal* to Miss Freya Stark, for her travels in the East and her account of them; and the *Patron's Medal* to Mr. Owen Lattimore, for his travels and studies in Central Asia.

The Council have awarded the *Victoria Medal* to Dr. Harold Jeffreys, for his researches in the Physics of the Earth; the *Murchison Grant* to Dr. S. W. Wooldridge and Mr. David Linton, for their work on the structure and surface features of S.E. England; the *Back Grant* to Surgeon-Commander Murray Levick, R.N., for his organization of the Public Schools Exploration Society; and the *Gill Memorial* to Lieut.-Commander L. C. Hill, R.N.R., for his services to geography in command of the R.R.S. *Discovery II*.

POLLEN-ANALYSIS AND QUATERNARY GEOLOGY

It is more than worth while to call attention to a recent lecture by Dr. Godwin printed in the *Proceedings of the Geologists' Association*, 52 (1941) 328. It is a most useful summary of some of the more important work on pollen-analysis undertaken not only by Godwin in this country, but also by workers abroad.

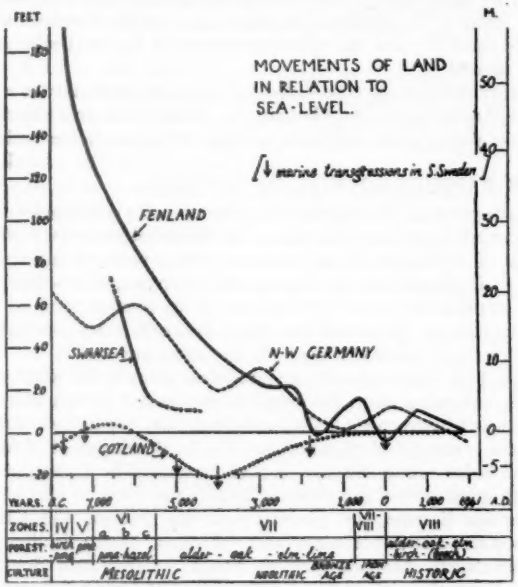
The chief problem of Quaternary geology is that of finding a time-scale as time has been too short for the evolution and dispersal of animals which might serve as zone-fossils. Pollen-analysis gives us, at present, by far the best time-scale for recent deposits. The results of sampling, counting, and classifying the pollen grains can be readily and simply expressed in diagrams which, for any selected locality give a clear picture of the prevalent vegetation at any one level, and of its changes as the deposits were forming. The best deposits for the preservation of pollen grains are peats, lake muds, and similar formations. As the greater part of natural vegetation is, and has been, woodland, we can assess the general nature of past times by the identification of the pollen grains. Locally, swamps or salt-marsh vegetation can be similarly dealt with. As the vegetation also reflects the climate very closely, we have accordingly a means of recording post-glacial changes of climate.

The fullest information is available for the Fenlands in this country. In Britain eight post-glacial zones are recognized: of these, numbers I, II, and III are absent in the Fens, and the history there starts with IV: the Birch-pine zone. In this note details are unnecessary, as the Fenland has been very fully discussed by Godwin in two papers: 1938 (with M. H. Clifford), *Phil. Trans. Roy. Soc.*, B. 229, and 1940, *ibid.*, B. 23. These zones are used as the foundation of all correlation between different regions. In considering the forest history of these islands, "It is interesting to find that the division of the country into a northern and western division on the one hand, and a southern and eastern division on the other, has not only persisted through so long a period [*i.e.* the post-glacial], but has been independently recognized in the present day by Professor Tansley . . ."

The application of the method to archaeology and especially to geology is most valuable and convincing. Peat deposits are particularly good indices of climatic change. In this country peats are either "ombrogenous," formed where peat growth is maintained by a combination of high rainfall and low evaporation; or "topogenous," formed in an area which collects the rainfall of a large region. The hill peats belong to the former and the fen peats to the latter

class. In addition, where rainfall conditions do not favour peat formation on sloping ground, "but upon flat surfaces, and above the flat fens which have filled in former lakes, there grows the type of ombrogenous mire known as the *raised bog*." In these bogs as a result of climatic change there is often a marked separation into upper and lower layers: the upper Sphagnum layer is fresh, with little humus, and pale in colour; the lower is dark, strongly humified, and shows little trace of organic structure. The separating surface is the Grenzhorizont, first recognized by Weber in north-western Germany. Conditions above the Grenzhorizont, or boundary layer, were suddenly very much wetter and colder; the period of this climatic change is generally agreed to be about the transition of the Bronze Age to the Iron Age, *i.e.* about 500 B.C.

Pollen-analysis also assists in elucidating the history of lakes because the


FEET
M.
MOVEMENTS OF LAND
IN RELATION TO
SEA-LEVEL.
marine transgressions in S. Sweden
FENLAND
SWANSEA
N-W GERMANY
GOTLAND
YEARS. B.C. 7,000 5,000 3,000 1,000 0 1,000 1940 A.D.
ZONES. IV V VI a b c VII VII-VIII VIII
FOREST. pine-hazel alder - oak - elm - lime
CULTURE MESOLITHIC NEOLITHIC BRONZE AGE IRON AGE HISTORIC

deposits of a lake-basin inevitably record the vegetational succession which goes on in its natural invasion and filling up. Pollen grains gather in great numbers in the nekron-muds, and as lakes probably receive pollen from all the surrounding area, it follows that a careful analysis of samples taken from a series of bores will greatly help in solving stratigraphical and other problems. This has been done at Tregaron (Cardiganshire) and elsewhere, and shortly before the war was beginning to be applied to the Norfolk Broads by J. N. Jennings.

One of the most fruitful fields of application however is to coastal deposits. The many "submerged forests" around our coasts as well as deeper water deposits such as the moor-log from the North Sea afford interesting material. The history of the North Sea has been made much clearer, both as a result of work on the continental shores and in this country. It appears that the greater part of the extension of the North Sea to its present limits took place between zones V and VI. Incidentally, it is important to stress the fact that submerged peats

and forests formed at all times during the post-glacial period. It is therefore very misleading, in fact quite wrong, to speak of *the* submerged forest period: in the same way to speak of it as Neolithic is incorrect.

To determine former levels of land and sea, isolated peat beds are not by themselves very useful. It is in estuaries and gulfs where there have been alternations of level that the best results are obtained: submergence causes a transgression of silts and clays over previously formed peats, and emergence the converse. Consequently there is an alternate thinning-out of silts and clays on the sea side, and of the peats on the land side. This is extremely well seen from borings in the East Frisian marshes, and in England borings show somewhat similar conditions in the Fenland, the Somerset Levels, Swansea Bay, and elsewhere. By using the data obtained from these and other places, the figure (reproduced by permission of the Geologists' Association) was constructed. It is naturally likely to be modified in detail as a result of newer work, but it may be relied upon to show the main movements of the land relative to the sea in the areas named.

Several other matters are considered in the paper, but short of a précis they cannot be discussed here. Dr. Godwin has made his points clearly and concisely, and the paper is an admirable epitome of a complicated subject.

J. A. STEERS

THE GEOGRAPHICAL PIVOT OF HISTORY

Thirty-eight years ago Sir Halford Mackinder read a paper before the Society expressing certain broad generalizations on historical geography which, in the present state of world affairs, have been arousing renewed interest. This has been due to their adoption by the German writer on geopolitics, Karl Haushofer, and to their applicability to certain features of the present conflict. The paper, which was written on the eve of the Russo-Japanese war, bore the title "The geographical pivot of history" (*Geogr. J.* 23 (1904) 421–44).

As envisaged by Mackinder the geographical pivot is the north and interior of Euro-Asia, extending from the Arctic to the central deserts and westward to the broad isthmus between the Baltic and Black Seas. In its belt of steppe-lands this pivot area presented ideal conditions for the development of high mobility by camel and horse-riding nomads. It is encompassed by a crescent of marginal regions, with great settled populations, largely maritime in character and outlook: peninsular Europe, the Middle East, the Indies, and China proper. Beyond this is an outer or oceanic crescent of insular or practically insular lands, curving from North America through South America and South Africa to Australasia. From the earliest times a succession of centrifugal raids by mobile nomads has descended from the steppes upon the countries of the marginal crescent. Thus in history the reactions of two kinds of mobility can be distinguished, the one on the Great Continent and based upon the interior lines of the pivot area, the other on the Ocean and based on the lesser continents and islands, through the control of which, after the voyages of Columbus and da Gama, was established the world supremacy of the western European nations.

During the nineteenth century however began a fundamental change, for the nomadic tribes were gradually replaced by Russian farmers and miners, following in the wake of the railways and heralding the establishment of new kinds of mobility within the pivot area. Thus Russia has come to occupy, with a new base of peasant and industrial man-power, the central strategic position in the world at large, similar to that held by Germany in Europe. With continued economic growth, and if ways were conquered over the marginal crescent to ocean fronts, an ambitious pivot state would be in sight of world empire: to

combat this a series of bridgeheads would be sustained in the marginal crescent by the navies of the overseas powers. In conclusion, Mackinder pointed out that the substitution of some new control of the inland area for that of Russia would not tend to reduce the geographical significance of the pivotal position.

Mackinder considered this analysis of the geographical pattern of the surface of the globe as of permanent value, and contrasted it with such superficial generalizations as "the westward march of empire." "For the first time" he was writing in 1904 "we can perceive something of the real proportion of features and events on the stage of the whole world." Not only was the exploration of the globe virtually complete at the beginning of this century, but there was "scarcely a region left for the pegging out of a claim of ownership, unless as the result of a war." Moreover the building of trans-continental railways was transmuting the conditions of land power. In 1904 Russia was preparing to fight Japan at the end of 6000 miles of the newly constructed Trans-Siberian line.

It is not difficult to distinguish the elements in this remarkable analysis of geographical relationships that have attracted the disciples of the Haushofer school of geopolitics.[1] The notion of controlling the heart of Euro-Asia fits in with the general policy of the 'Drang nach Osten.' Moreover this conception of the exploitation of interior lines on the greatest scale possible promises a dangerous challenge to sea-power. The principle has lately been demonstrated in the more confined area of Europe, by the campaigns of Norway, Greece, and Crete, but the ability to practise it in its widest scope still eludes the enemy. The counter to it remains the maintenance of the command of the seas and the gradual accumulation of superior military power on the "bridgeheads" of the maritime crescent.

In February 1919 Sir Halford Mackinder published a book entitled 'Democratic ideals and reality,' in which he further developed his argument and expressed the view that the war which had ended three months earlier had not shaken the soundness of the generalizations he had outlined fifteen years earlier. This book is to be shortly reissued in the States to meet the demand there resulting from references to it by well-known American journalists.

ADMINISTRATIVE DIVISIONS OF THE REPUBLIC OF PANAMA

We are informed by the Foreign Office of changes in the administrative divisions of the Republic of Panamá effected by Panamanian Law No. 103, 12 July 1941. As compared with the 1920 census there has been a considerable reduction in the number of provinces and districts. The Republic of Panamá now consists of seven Provincias instead of nine in 1920, one Comarca, and thirty-six instead of sixty-two Distritos. The province of Darien has been suppressed and amalgamated with the province of Panamá. The provinces of Herrera and Los Santos have been fused into a single province called Los Santos with the capital at Chitré, formerly the capital of Herrera. The district of San Carlos has been transferred from Panamá to Coclé. The changes in districts are rather complicated. In most cases districts have been amalgamated and the name of the most important given to the new division: for instance the district of Panamá which includes the 1920 Panamá, Arraiján, Chepo, Chimán, and Taboga. Sometimes new names are given: Bejuco in Panamá, which includes Capira and Chame of 1920.

[1] In his 'Weltpolitik von heute' (1934) and again in his 'Weltmeere und Weltmächte' (1937), Haushofer discussed Mackinder's 1904 paper and reproduced his diagram (*Geogr. J.* 23 (1904) 435) showing the relation of the Pivot Area and the two Crescents to the Polar Ice and Sahara Desert.

ANGLO-SOVIET SCIENTIFIC COOPERATION

At a conference on Anglo-Soviet scientific cooperation held recently at the Royal Society, a sub-committee was appointed to carry out suggestions for promoting closer relations between British and Russian scientific institutions and scientists. We are informed that arrangements have now been made to forward letters from British to Russian scientists, and that communications for transmission to the U.S.S.R. should be addressed to Sir John Russell, Ministry of Information, Malet Street, W.C.1, or to Mr. J. G. Crowther, British Council, 3, Hannover Street, W.1.

PROSPECTS OF WHITE SETTLEMENT IN AFRICA SOUTH OF THE ZAMBEZI

In his presidential address last year to the South African Geographical Society, Mr. F. E. Kanthack discussed the prospects of white settlement in Africa south of the Zambezi (*S. African Geogr. J.* 23 (1941) 3–20). This has been the subject of several studies, but the latest is useful for its emphasis upon certain aspects such as irrigation and agricultural policy. The generally adverse climatic conditions are known: though the climate south of 17° is on the whole suitable for Europeans, the rainfall, both in character and total quantity, hampers pastoral and agricultural development. He considers that, for example, 86 per cent. of the Cape Province is incapable, without irrigation, of producing crops, and conditions in South-West Africa are worse. The great geological age of the sub-continent results in a poor dry soil, and possibilities of large irrigation schemes are small, for the river courses are unsuitable. Much has been done by drilling bore-holes, which supply water for stock but not for arable farming, which is therefore confined to a relatively few favoured areas. Arid conditions lead to periodical heavy losses of stock and to over-grazing, which contributes to the progress of soil erosion.

The economy of the country is founded upon mineral wealth, a wasting asset, and further urban development also depends upon the availability of adequate water supplies for domestic and industrial use. Fortunately the Witwatersrand has been able to obtain sufficient water from the Vaalbank dam, but Pretoria will also have to turn shortly to that source, and other cities must undertake increasingly extensive storage schemes, for which the natural conditions are not always favourable. Mr. Kanthack examines in some detail the distribution of the white and native populations, and emphasizes the tendency for both to compete for the same farming land, the drift of the former to the urban centres, particularly from the drier rural areas, and the deteriorating pastoral conditions. He urges that with a proper conservation policy, the pastoral industry could become much more productive, either by limiting the number of stock carried, or bringing in reserves of fodder from outside. In his opinion the export of maize should be prohibited, and a more rational distribution of fodder crops secured. For all these reasons he considers that the white population must remain small, and that the future of the country depends upon the extent to which the present population can be induced to reclaim and conserve the surface of the land.

CORRECTIONS TO THE APRIL *JOURNAL*

In Sir Malcolm Watson's paper on "The geographical aspects of malaria," line 47, page 164, should of course read 3,000,000 acres of rubber. It was not stated that "To the summit of Tasman," by Alan C. Browne, had been read as a paper at the Meeting of 3 February 1941.

OBITUARY

DR. HEINRICH DÜBI

Dr. Dübi, an Honorary Member of our Society, died at Bern on January 23 at the age of ninety-three. In his earlier years he was an enthusiastic and enterprizing Alpine mountaineer and carried out a number of notable expeditions in the intervals of his work as a teacher of classics, one of which was the discovery of a new route from Rottal up the Jungfrau. His literary interests, combined with his enthusiasm for his native mountains, led to his extensive researches into the history of Alpine mountaineering which he continued despite growing blindness. Among his published works are climber's guides for the Bernese Oberland, a monograph vindicating Paccard's share in the first ascent of Mont Blanc from the attacks of critics, and articles in the *Alpine Journal* on early Swiss pioneers in the Alps. Of particular value also was his work as editor of the *Jahrbuch* of the Swiss Alpine Club for thirty-two years from 1891 to 1923. Dr. Dübi numbered Freshfield, Whymper, and Farrar, among his British friends, and his election as a Honorary Member in 1916 marked the wide recognition he enjoyed here as a historian of Alpine mountaineering.

LIEUT.-COMMANDER L. C. BERNACCHI, O.B.E., R.N.V.R.

Louis Bernacchi, who died on 24 April 1942, was born in Tasmania in 1876, and received his academic training at Melbourne Observatory. Bernacchi had the distinction of being the first physicist to winter in the Antarctic when in 1898 he went south as one of the staff on the *Southern Cross* under Borchgrevink. He was one of the most prominent members of the wintering party at Cape Adare, and on his return was awarded the Peek Grant by the Society.

After a short interval he was persuaded by Captain Scott to join the National Antarctic Expedition, and in November 1901 boarded the *Discovery* on her arrival at Lyttelton. Bernacchi was responsible for the magnetic observations which had been placed in the forefront of the scientific programme. He was an energetic and tireless observer, and, although his work naturally tied him rather more than others to the expedition's headquarters, he was also a good sledger, and in the second sledging season he accompanied Lieut. Royds and four others on a valuable expedition south-eastwards over the Ross Barrier. Mention should also be made of his initiation of weekly debates on board ship and of his value in promoting good feeling throughout the party. Bernacchi was a cheerful and loyal friend of all on board. Another activity was his work as editor in the second winter of the *South Polar Times*, to which he contributed many articles.

In addition to his Antarctic explorations Bernacchi had travelled in such widely separated countries as Namaqualand and German South-West Africa, the Upper Amazon basin, and Central Borneo. The Antarctic however always remained his real interest. He was one of the originators of the Antarctic Club, and was also responsible for organizing a successful Polar Exhibition in London in 1930. At one time he had plans for leading an expedition himself, and with this end in view carried out some preliminary motor sledge trials in Norway.

In the war of 1914–18 Bernacchi served as Lieut.-Commander, R.N.V.R., and at the outbreak of the present war he again joined up and was doing useful work until ill-health prevented further activity. His publications include 'To the

South Polar regions,' 1901; 'A very Gallant Gentleman' (Captain L. E. G. Oates), 1933; and 'Saga of the *Discovery*,' 1938. He had been a Fellow of the Society since 1900, and served for some years on the Council. R. W. S.

MEETINGS: SESSION 1941–42

Twenty-second Meeting, 13 April 1942. The President in the Chair

Paper: The map of the Pacific. Discussion opened by Colonel Sir Charles Arden-Close

Twenty-third Meeting, 20 April 1942. The President in the Chair

Elections: Tom Barnard, B.SC., F.G.S.; Major the Hon. R. A. B. Hamilton; J. C. C. Williams

Paper: Six weeks in Shabwa. By Major the Hon. R. A. B. Hamilton

Twenty-fourth Meeting, 27 April 1942. The President in the Chair

In the Netherlands-Indies: Kodachrome films, by Mrs. Stephen Courtauld

Twenty-fifth Meeting, 4 May 1942. The President in the Chair

Elections: H. J. Howells, F.C.I.B.; Major E. G. A. Lett; Captain A. P. Quaife

Paper: The Caucasian Borderland. By Captain W. E. D. Allen

Twenty-sixth Meeting, 11 May 1942. The President in the Chair

Paper: Making the British Council Map. Read by Mr. A. R. Hinks

Twenty-seventh Meeting, 18 May 1942. The President in the Chair

Election: H. C. Withers, B.SC.

Paper: The Burma Road. By Sir Henry Craw